جزوه زبان تخصصی

رشته مهندسی صنایع

مؤلف:
منوچهر صدریان

Contents

Lesson 1:

Brief history of industrial engineering:

In 1908, the first separate departments of industrial engineering were established at Pennsylvania State, and Syracuse universities. The department at Syracuse discontinued shortly after initiated, and not reestablished until 1925. After the war in 1947, many returning veterans were interested in industrial engineering program.

In 1953, in order to fill the gap between management and engineers, and also increase in operations research applications, establishment of I.E major became a necessity. At this time, many of the courses which had existed as options in the mechanical engineering became a part of new industrial engineering curriculum.

By 1960s, there were 74 schools offering courses in industrial engineering, of which 48 were initiated by the Engineering Council for Professional Development (ECPD). This rapid growth in sources of industrial engineering education along with enormous students pursuing degree programs, greatly affected establishment of I.E major. In 1966, there were 9800 students in the undergraduate and graduate industrial engineering programs, which ranked fifth in enrollment among the engineering disciplined, behind electrical, mechanical, civil and chemical. By 1968, the number of schools offering I.E curriculums grown to 126, of which 57 were accredited.

"In a survey conducted, among 250 career based on 12 factors such as income, long job security, stress, and social prestige, I.E ranked 35th, and first among all engineering majors, while mechanical engineering ranked 45th"(IE solution-may 1999).

Nowadays industrial engineers work in all sectors of the society, from industries to service facilities, due to their systematic thoughts.

Definition of Industrial engineering:

According to American Institute of Industrial Engineering (AIIE); "I.E. is concerned with the design, improvement and installation of integrated system of

people, materials, equipment and energy. It draws upon specialized knowledge and skill in the mathematical, physical and social sciences together with the principles and methods of engineering analysis to design, specify, predict and evaluate the result to be obtained from such systems".

Scope of industrial engineering activities are as follows:

Forecasting, inventory planning and control, production planning, plant layout and location, quality control, manufacturing process, materials science, motion and time study, human factors engineering, engineering economy, project planning and control, cost estimation, preventive maintenance, industrial safety, wage and salary administration, job assessment, evaluation, and enlargement, materials handling, application of ISO standards, simulation , management information system and other optimization principals.

Developments in Industrial Engineering

year	Originator	Concept, Principle Or Approach
1490	**Shipbuilders of Venice**	**Assembly line construction**
1776	**Adam Smith**	**Specialization of labor**
1798	**Eli Whitney**	**Interchange parts**

1880-1915	Frederick Taylor	Principles of scientific management, exception principle, methods analysis, time study and standards
1910-1924	Frank Gilbert	Methods analysis and motion study
1924-1973	Lillian Gilbert	Fatigue and human factors, selection and training of employees
1890-1919	Henry Gantt	Activity scheduling charts, incentive pay systems, humanistic approach to labor
1908	A. Erlang	Queuing theory
1913	Henry Ford	Moving assembly line
1917	F. Harris	Economic lot size
1925	Czechoslovakia	Group technology
1931	Walter schewhart, H. Dodge	Statistical quality control
1934	Elton Mayo	Participative management, motivation and productivity
1934	R. Wilson	Statistical order points
1934	L. Tippet	Work (activity) sampling
1940	Operations research groups in the United Kingdom	Multidiscipline team analysis of complex problems
1947-present	George Dantzing	Simplex method of linear programming
1950 –present	Many individuals	Application of simulation to operation
1951	Ford Dickie	Application of ABC approach
1959	R. Brown	Exponential smoothing forecasting
1959-1961	James Kelley, M. Walker, and U.S. Navy Special	Network project management techniques
1968-1975	Joseph Orckley, George plossel, Oliver Wight and	Dependent/independent demand concept and material requirements planning (MRP)
1960-present	Japanese manufacturing management and engineers	Japanese manufacturing management approaches
1970-present	William Skinner	Integrating operations management and organization strategies and policy
1980-presrnt	Many individuals	Management information system

WRITE TRUE (T) OR FALSE (F):

1) (…) In 1908 first department of IE established at Penn. University.

2) (…) I.E. was initiated in 1925 in many universities.

3) (…) By 1960's, there were 100 schools offering curricula of IE.

4) (…) The rapid growth in resources of I.E. education was matched by enormous students pursuing degree program.

5) (…) Industrial engineers tasks only apply in industries.

CHOOSE THE CORRECT ANSWER:

1) The industrial …….beginning in the nineteenth centuries.

a) administration b) revolution

c) contribution d) experimentation

2) Industrial engineering can ……, it's standing by Integrating organization resources.

a) engrave b) fuse

c) Scarce d) enhance

3) The knowledge of natural science can be gained by……..

a) study b) practice

c) experience d) all of the above

4) Harris was the originator of……..

a) project management b) queuing theory

c) economic order quantity d) quality control

5) Gant chart is a……. ……..

a) concept b) approach

c) Principle d) develop

6) Which method was developed in 1947?

a) MRP b) simplex

c) CPM d) ROP

Fill in banks with appropriate word:

Needs- Satisfying - successful - requires- political- important- activity

Industrial eng. activities of analysis and design are not an end in them but are a means for …….consumer's needs. One aspect concerns with the materials and forces of nature; the other words is concerned with the ……needs of people.

In the system age, accomplishment of eng., Objectives …….. a combination of technical specialties and experience. Engineering in the system age must be a team ……where various individuals involved are cognizant of the ……..relationship between specialties and between economic, ecological….. and social factors.

Read the following, and then choose the best answer:

Since industrial engineers work with the total system, they are necessarily responsible for the integration of the production worker into the system. Industrial engineers are concerned with factors which govern work performance to a greater extent that are most other professional engineers. Typically, they are required to be familiar with and apply progressive methods in industrial management.

Industrial engineers advise management and production officials on such matters as establishing organizational patterns and systems and procedures, planning flow of work, establishing work controls, planning and controlling quality of the process or product, establishing cost and budgetary controls, and measuring the overall effectiveness of the organization, that include methods, systems and procedures. They identify the need for changes in the organization procedures, and develop plans for reorganization of facilities. They investigate and evaluate factors affecting performance of men, materials, equipment, and integrated system. They make or overview the results of work measurement and work simplification studies, and analyze factors leading to operator fatigue, or safety.

Because of their broad understanding of the basic activity areas of management, and their engineering approach to management problems,

industrial engineers are frequently used as a staff advisor to top management on non engineering problems of a high management level as well as on problems which are characteristic of IE work per se.

1) What is the main topic of this passage?

a) Industrial engineering positions b) Industrial engineering planning

c) Activity areas of management c) Industrial engineering functions

2) Which one can be inferred from the passage?

a) IE propose improvements with predictions of the expected results.

b) Some management problems involve application of engineering Principals and practices.

c) IE is a dynamic field covering only areas of engineering activities.

d) There is no overlap between the work of MGT. and IE.

3) Which one is not a responsibility of an industrial engineering?

a) increasing spending in organization

b) planning the rearrangement of equipment

c) proposing different course of action

d) advising managers and production officials

4) The word "they" in line 4 refers to …….

a) industrial engineers b) methods

c) professional engineers d) factors

5) According to the passage, IE s can advise on organizational management because,…….

a) they are skilled at solving engineering problems.

b) they look at management problems through engineering viewpoint.

c) they are familiar with the most effective type and form of management.

d) they can identify needs for changes in organizational management.

Read the following, and then choose the best answer:

Nowadays, industrial safety and environment production rank alongside the technically optimized manufacturing process. There is a wish to see harmonization of ecology within economically viable production. For the metal working industry this means using cooling lubricant in technologically sound application while, at the same time, implementing and refining maintenance and recycling concepts.

1) The technically optimized manufacturing process:
   a) Stands in sharp contrast with safety and environmental issues.
   b) Is to be considered on equal rank with safety and environment.
   c) Must be reached considering safety and environment as equally important.
   d) All of the above

2) The harmony of ecology and economy of production……
   a) is impossible to reach
   b) cannot be passed by
   c) is a wish
   d) has no importance

3) For the metal working industry the balance in sound application of cooling lubricants and implementations and refining and maintenance and recycling concepts:
   a) Is the harmony of ecology and economy of production.
   b) Is indicative of equal ranks for process versus safety and environment.
   c) Is a principle to observe in the entire metal industry.
   d) Is a special isolated case.

PUT THE FOLLOWING WORDS IN ORDER:

1) there-reasons-not- new- is-today-little-keeping-abreast-developments-new.

2) I.E organization -an effective- must –specific- to the -be responsive -needs of it serves -organization.

Lesson 2:

Forecasting:

The first step of planning in any organization is forecasting. Bad forecast can result in a catastrophic situation. The idea behind any forecasting is to predict (project) future values. On way of categorizing the techniques used in forecasting are as follows:

Qualitative Techniques (Judgmental Forecasting):

These techniques are utilized when no or very few historical data are available. In these methods, experts' opinions and their predictions are considered the ultimate forecasted values. In forming their opinions, experts usually refer to similar situations and analyze the limited data in order to reach forecasted values. Delphi method, historical analogy, market research, customer surveys, panel consensus, economic indexes and wild guessing are also qualitative forecasting techniques that can be classified under judgmental forecasting. Although not commonly used, these qualitative techniques may be the only method available forecast, for example, the sales of a new product, and lack of past data.

Quantitative Techniques:

In this technique, the historical pattern of the data is used to extrapolate (forecast) into the future. Time-series analysis treats a sequence of observations as a function of past history. The techniques of time-series analysis are moving averages, exponential smoothing and regression. The technique of regression is a widely used tool to model both time-dependent and structural relationships.

Another way of classifying in using qualitative is according to the forecasting range.

Short-Range forecasting:

A typical period of hours to one year is considered short range forecasting. Therefore, hourly, daily, weekly and monthly forecast are short-range forecasting. For example, electric utility companies use hourly forecasting of

kilowatt-hour demand, while the production planning of manufacturing systems is usually based on the monthly forecast of units sale.

Medium-Range forecasting:

The time period of the medium range is from one to 5 years. A typical example of medium-range forecasting is the enrollment of students in colleges and universities. One year forecast is the most accurate, while the 5-year forecast is the less accurate; this is due to the increase of uncertainty in the stability of the underlying data generating process with increase in the period of forecasting.

Long-Range forecasting:

The time period of the long range is more than 5 and less than 10 years. For example freight of commodities, and telephone services in order to a reasonable and cost-effective expansion of the network.

2.3. **Forecasting Procedures**

The first step in determining which forecasting procedure should be used is to plot the historical data as a function of time. One might suggest that after plotting the data, an exact curve that passes through each of the points could be used for accurate Forecasting. In contrast, it will be shown that the exact fit may, in many cases, yield very poor forecasted values.

Forecasting models:

1) moving average
2) weighted moving average
3) Exponential smoothing
4) Regression
5) Non linear regression
6) Exponential regression
7) Sinus regression
8) Seasonal regression

WRITE TRUE (T) OR FALSE (F):

1) (…) An exact curve that passes through each of the point could be used for accurate forecasting.

2) (…) Delphi method is a quantitative approach.

3) (…) The time period of long range forecasting is from 5 to 10 years.

4) (…) Qualitative techniques are utilized when no or very few data are available.

5) (…) Randomness of data makes accurate forecasting difficult.

CHOOSE THE BEST ANSWER:

1) Time series forecasting is one of the …….. techniques.

a) Qualitative b) regression

c) Quantitative d) all of the above

2) Electric companies use …….. forecasting.

a) Short range b) medium range

c) Long range d) depends on Circumstances

3) Sinus regression is used for …… data.

a) Uniform b) periodic

c) Seasonal d) all of the above

4) Regression is used for…… data.

a) uniform b) seasonal

c) periodic d) all of the above

5) Which is not a forecasting method?

a) moving average b) linear programming

c) regression d) exponential smoothing

Fill in the blanks with appropriate word:

dependent - situations- model- function- necessary

In many …… there are nonlinear relationship between the …….and independent variables which become ……to transform the ……to fit the linear regression ……..

Read the following, then choose the best answer:

Forecasting is the process of making statements about events whose actual outcomes (typically) have not yet been observed. A commonplace example might be estimation of the expected value for some variable of interest at some specified future date. Prediction is a similar, but more general term. Both might refer to formal statistical methods employing time-series, cross-sectional or longitudinal of data, or alternatively to less formal judgmental methods. Usage can differ between areas of application: for example in hydrology, the terms "forecast" and "forecasting" are sometimes reserved for estimates of values at certain specific future times, while the term "prediction" is used for more general estimates, such as the number of times floods will occur over a long period. Risk and uncertainty are central to forecasting and prediction; it is generally considered good practice to indicate the degree of uncertainty attaching to forecasts.
Forecasting is used in the practice of Customer Demand Planning in every day business forecasting for manufacturing companies. The discipline of demand planning, also sometimes referred to as supply chain forecasting, embraces both statistical forecasting and a consensus process. An important, albeit often ignored aspect of forecasting, is the relationship it holds with planning. Forecasting can be described as predicting what the future will look like, whereas planning predicts what the future should look like.

Questions:

1- What is forecasting?

a- The last step in planning in any organization.

b- The first step in planning in any organization.

c- It is the process of making statements about events.

d- None of the above

2- What is the similarity between forecasting and prediction?

a- Both might refer to formal statistical methods employing time series and cross-sectional.

b- They are totally different.

c- Prediction is a similar, but more general term.

d- both a and c

PUT THE FOLLOWING WORDS IN ORDER:

1) types- there- many –models- of –are- forecasting.

2) uncertainty- involve-future-the forecasting.

Lesson 3:

INVENTORY SYSTEMS:

3.1. Introduction

The demand forecast, discussed in lesson 2, is one of the primary inputs for making inventory decisions. We define inventory as raw material, semi finished parts, assemblies and finished goods that are in a production system at any point of time. Inventories serve as a buffer between warehouse and every stage of production system and between the production system and its customers.

The main objective of analysis an inventory system is to find the answers to the following two questions:

1. How much should be ordered (or produced)?
2. When the orders should be placed

Such that the total inventory cost is minimized.

Purchased parts and materials constitute 30 to 60 percent of the cost of goods sold in most manufacturing firms. Thus, a small percentage decrease in the cost of purchased items can result in a much larger percentage increase in profits. For example, if the cost of purchased materials is 50 percent of sales and profit is 10 percent of sales, decreasing the cost of those same purchased materials to 48 percent, will increase the profits 20 percent. Volasky (1981) has reported how Lubriquip Company saved 1140,000 in the cost of purchased items through a formal program focused on several high dollar product groups. Since purchasing also is crucial in achieving product quality and delivery schedules, thus study of purchasing policies, procedures and decision can be rewarding.

Inventory costs can be classified as (1) the cost of holding inventories (holding cost), (2) the cost of incurring shortages (opportunity cost), and (3) the cost of replenishing inventories (order cost). These costs are now explained in detail.

3.2. INVENTORY COSTS:

3.2.1. INVENTORY HOLDING COSTS:

The cost of holding inventory can be broken down into several components:

1) The opportunity cost money being tied up in inventory, for example, the interest forgone because that money is not placed in an interest bearing account.
2) Storage and space charges, representing the cost of providing storage space as well as its cost of personnel, maintenance, also cost of handling units and cost of computers and logistic forms which are used to keep track of the inventory.
3) Taxes and insurance and the cost of physical deterioration and its prevention, as in the case of inventorying dry cell batteries, vegetables, dairy products.
4) The cost of obsolescence due to technological change, as in the fields of personal computers, robotics, and communications equipment and cost of peripherals goods.

Total inventory holding cost is approximately between 24 to 27 percent of total inventories cost in one year.

3.2.2 SHORTAGE COSTS

This cost is incurred if units of inventory are not available when demanded. It is the cost of lost sales, of loss of goodwill, of overtime payments, of customer dissatisfaction, and of special administrative efforts (telephone calls, memos, etc) resulting from the inability to meet demand. There are two types of shortage costs:

1) one-time shortage cost per unit short, independent of the duration of the shortage, and
2) Shortage cost per unit short per unit time.

3.2.2 ORDERING COST

Order costs(replenishment cost) include the cost of preparing and placing orders for replenishing inventories, the cost of handling and shipments of orders, the cost of machining setups for production runs, the cost of inspection of received orders in inventory, and all costs that do not vary with the size of the order. Sometimes it is difficult to determine these costs in details; the analyst may combine costs.

3.3. THE TERMINOLOGY OF INVENTORY SYSTEMS

The following definitions are used in conjunction with the analysis of an inventory system.

3.3.1. DEMAND

Inventory decisions (policies, quantities to be ordered, etc.) are made with reference to future demand. The demand can be deterministic or probabilistic and static or dynamic in nature; it is the usage rate of a product. The demand rate is the quantity demanded per unit time. The demanded rate can be constant, variable, or probabilistic, and there are various methods of solving each model.

3.3.2. LEAD TIME AND REPLENISHMENT RATE

Lead time is the time interval between the times when an order is placed until the order is actually received. The lead time can be deterministic or probabilistic and constant or time varying. The replenishment rate (procurement rate, production rate) is the rate at which the inventory builds up.

3.3.3. REORDER LEVEL (re order point)

The reorder level is the inventory level at which orders are placed for replenishing the inventory. The reorder level is a function of the lead time.

3.3.4. SAFETY STOCK:

Safety stock is inventory that always is in warehouse, to prevent a stock out when there is uncertainty in the demand or supply process. Safety stock is a function of the lead time.

WRITE TRUE (T) OR FALSE (F):

1) (…) Inventory decisions are made with reference to future demand.

2) (…) The demand rate is the quantity demanded per unit time.

3) (…) The demand always is static.

4) (…) Overtime payment is an inventory shortage cost.

5) (…) Partially completed goods, is work in process.

6) (…) The goal in inventory is to determine the requisitioning level.

7) (…) Recorder level is the inventory level at which orders are placed for replenishing the inventory.

8) (…) The recorder level is a function of the lead item demand.

9) (…) The cost of inspection is an inventory holding cost.

CHOOSE THE BEST ANSWER:

1) Inventory level at which orders are placed for replenishing is ….time.

a) Safety stock b) lead time

c) re order level d) order quantity

2) The time between ordering and receiving the order is ….

a) Lead time b) Safety stock

c) re order level d) order quantity

3) The demand can be …….

a) Probabilistic b) static or dynamic

c) deterministic d) All of the above

4) Safety stock is a function of the …….

a) demand b) safety stock

c) lead time d) reorder level

5) The cost of machine setup is an inventory…..cost.

a) holding b) ordering

c) shortage d) production

6) Probability that demands will not exceed supply during lead time is…..

a) Reorder level b) safety stock

c) shortage cost d) lead time

7) Stock or store goods is…….

a) Inventory b) demand

c) safety stock d) none of the above

CHOOSE THE BEST WORD TO COMPLETE THE PARAGRAPH:

Measures- service- applies- available -historical

Idle time due to material and component shortages ……...to internal customer service. This is an absolute measure of the manufacturing or……time or parts are not ……to the work force. Absolute …… make sense when a company has…….data to use in comparison.

PUT THE FOLLOWING WORDS IN ORDER:

1) built-of future-in-built-inventory-anticipation-demand-items-inventory.

2) results-the actual-purchased- fluctuation-from-quantity-inventory-lot-size

Lesson 3.1

Inventory control and ordering policies:

ABC ANALYSIS:

One of the first steps in managing purchased items should be the performance of an ABC analysis. Applying the ABC principle to purchasing management involves:

1. Classifying items on the basis of relative importance.
2. Establishing different management controls for different classifications with the degree of control being commensurate with the ranked importance of each classifications.

The letters A, B, and C represent different classifications of descending importance; however, it may he necessary to have more than three classes. Criteria for classification should reflect the difficulty of controlling an item that impacts on costs and profitability.

ABC analysis usually is illustrated using the annual dollar volume criteria. In a typical distribution, 20 percent of purchased items are A items, which account for 80 percent of the annual inventory cost. These items merit the most stringent purchasing controls. Typically, 30 percent of items are B items, accounting for 15 percent of the annual inventory cost. Thus, half the items are C items, together making up only 5 percent of the inventory cost.

For A and B items, ordering systems (policy) are used that minimize total cost and for the A items virtually guarantee against stock outs (shortage is not allowed).

Annual dollar volume is not the only criterion for ranking the value of an item. Other factors must be used to classify items in an ABC analysis include following:

1. Scarcity of material or capacity used in producing an item
2. Lead time
3. Storage requirements for an item

4. Pilferage risks, shelf life, and other critical attributes.
5. Cost of a stock-out
6. Engineering design volatility

Widespread application of electronic data processing to inventory and purchasing management has had an impact on some applications of ABC analysis.

Accurate and timely records now can be maintained economically on all items expect for those with very low costs. Such standard rivets, washers, and other pan stock items. For record-keeping purposes, only A and **B** items may exit; but record keeping procedures are only one aspect of inventory and purchasing management. Other planning and control procedures, such as evaluation of forecasts and cycle counting frequencies may be influenced by the result of an ABC analysis.

Inventory models:

In order to determine the correct ordering policy, it is very important to determine the correct demand pattern. The following are some demand patterns and ordering models**:**

A) Constant demand:

1) Economic order quantity (EOQ)
2) Economic production quantity (EPQ)
3) Order quantity with discount:
   a) Total discount
   b) Incremental discount
4) Coordinated ordering model

B) Variable demand models:

1) Least total cost
2) Least unit cost

C) Ordering policies:

1) Periodic review or fixed order interval(FOI) and denoted as (R,s,S) or (R,S).
2) Continuous review or fixed order size (FOS) and denoted as (rop, Q*).

WRITE TRUE (T) OR FALSE (F):

1) (…) 30 percent of items are B items.

2) (…) 45 percent of the annual purchasing budget is A items.

3) (…) Determining order level is necessary for C items.

4) (…) ABC analysis is sufficient for inventory analysis.

CHOOSE THE BEST ANSWER:

1) In ABC analysis…… percent of Purchased items are A items.

a) 20 b) 40 c) 30 d) 10

2) Which factor is used to classify items is an ABC analysis.

a) Lead time b) unit costs

c) cost of stock-out d) All of the above

3) …….. Percent of the annual purchasing budget are C items.

a) 25 b) 80 c) 30 d) 55

4) Periodic review is used for …….demand.

a) constant b) variable

c) Probabilistic d) both b and c

Fill in the blanks with the given words:

Replenishing – service – inventory – probabilistic – holding cost – uncertainty - safety stock – insurance – deterioration – shortage cost – Buffer stock

1) Safety stock inventory that is on-hand to prevent a stock out when there is …… the demand.

2) The recorder level is the inventory level at which orders are placed for …….. inventory.

3) The lead time can be deterministic or ……. and constant or time varying.

4) Taxes and ……..are considered the cost of physical …… are no of the inventory carrying cost.

5) Stock or store of goods called ……

6) Cost to carryon item in inventory for a length of time usually a year called ……

7) …….. price reduction for large orders.

8) Overtime payment is one the inventory ……

9) Safety stock the means ……

Read the following passage, and then choose the best answer:

Inventory analysis is an era in which more sophisticated quantitative tools have been used. Operations research has developed simulation models that reflect the major factors in inventory systems. Random generators are built to consider the primary sources of uncertainty in the system, such as demand or usage rate, lead time, production capacities, and etc. Typical costs considered are purchase, storage, ordering, and stock-out. The model is then used to evaluate reorder points, safety stocks, customer service level, review periods, and the response time of inventory system to extraordinary events. Once developed and in place, the model can be updated as economic. Thus the model can be used by management to evaluate its inventory system on an ongoing basis and to ensure that it is operating in a cost- efficient manner. Like the models described above, these inventory models are user-friendly and can be operated and maintained by management with little formal computer training.

1) The field of inventory utilizes:

a) Advanced decision making model

b) Sophisticated quantitative tools

c) Tools that quantify friendly terms

d) All of the above

2) The simulation models…….

a) Have been developed by operations research

b) Reflect major factor in inventory system

c) use random generators to reflect the main source of uncertainty

d) All of the above

PUT THE FOLLOWING WORDS IN ORDER:

1) model- the basic- EOQ -that –entire- arrives –replenishment- order at- one time-assumes.

2) no quantity-the basic- model -assumes –EOQ- that- available discounts- are.

Lesson 4:

AGGREGATE PRODUCTION PLANNING:

4.1. The Purpose of Aggregate Production Planning:

Customer demand enters the production system as units of products. However, production has to be planned as hours of machining and worker hours that must be dedicated to the production of that demand.

When planning work-force and related activities to service a given demand schedule, it is necessary to balance the cost of producing and holding inventory against the cost of adjusting activity levels to fluctuations demand. There are two main alternative production strategies. Alternative one uses a constant work-force level (i.e. constant production output rate). If the production output rate is greater than the expected demand rate in the earlier production periods, cumulative production will exceed cumulative demand, resulting in a significant inventory holding cost. Conversely, significant shortage cost.

Alternative 2 is a strategy to produce to demand such that the inventory holding costs are minimized. This alternative requires constantly adjusting the work-force levels (hire or fire) and paying significant overtime cost during the high demand periods.

These are two extreme alternatives: the optimal alternative is the one that minimizes the total cost of the inventory and the cost of adjusting the work-force level. The optimal approach for computing aggregate plans that could respond to

anticipated demand fluctuations, must attempt to incur a minimum overall cost of production. The primary output of the aggregate planning process is a master production schedule, which describes the number of units to be produced and the work-force levels required in each period.

The approach for finding the optimal alternative is to develop a total cost function which contains the major cost component of the production facility. This cost function is to be minimized while subject to constraints. The linearity or nonlinearity of the cost function and constraints and demand pattern determines the solution approach to the problem. For example, linear programming can be used for solving aggregate production planning problems with a linear function and constraints. Other approaches are used when the function or the constraints are nonlinear, probabilistic.

Aggregate production planning solution models:

1) Heuristic methods
   a) Constant workforce level
   b) Variable workforce level
2) Linear programming
3) Transportation model with production and holding cost
4) Dynamic programming with setup, production and holding cost
5) Nonlinear cost function (HMMS method)
6) Probabilistic demand
   a) Where level of confidence is known
   b) Where level of confidence is unknown
7) Hieratical control model
8) Flexible Manufacturing System and Group Technology concepts

WRITE TRUE (T) OR FALSE (F):

1) (…) Customer demand enters production system always is one unit.
2) (…) There are only two strategies in production planning.
3) (…) The solution in production planning always is optimal.
4) (…) There are only two solutions for solving aggregate planning.
5) (…) The fluctuating workforce is used in seasonal product facilities.

CHOOSE THE CORRECT ANSWER:

1) When cumulative production, exceeds cumulative demand results in a significant……. costs.

a) overtime b) shortage
c) inventory d) both a and c

2) The primary output of production planning is……

a) Workforce level b) Master schedule
c) overtime hours d) Shortage

3) The main objective of aggregate planning is……

a) workforce level b) minimum cost
c) master production schedule d) all of the above

Fill in the blanks with appropriate word:

estimates- constant- periods- production - Demand

Constant production and ……..rates rarely exist in real situations.

There may be substantial …….when both demand and production are restively…….. ,and for those situations can be applied. However, more often than not, the aggregate production plan will tend to resemble to the time–varying ……..and demand. Also, in the real situation the demand forecasts are likely to be point …….of an uncertain process.

CHOOSE THE BEST ANSWER:

There is no doubt that hierarchical approaches to the aggregate scheduling decision are important to the effectiveness of a firm. Hax and Meal point out that at the present time a hierarchical system constitutes a very natural approach to support the variety of complex decision encountered in the management of the overall production process, because existing data processing capabilities and comprehensive models are not adequate to develop a single model that optimizes an entire production system.

1) The main focus of the text is on "……."

a) Effectiveness of firm

b) Hierarchical decision making

c) Aggregate scheduling decisions

d) Management of a production process

2) One of the reasons why one cannot develop a single model to optimize the entire production system is the…….

a) Availability of less comprehensive models

b) Incapability of the current analytical models

c) Simplicity of multi-echelon production system

d) Inadequacy of the existing data processing techniques

PUT THE FOLLOWING WORDS IN ORDER:

1) desirability-disaggregation- and- the- necessity-of-is-situation-dependent.

2) to ensure- the-level-constraint-are-of variables-are-added-from-period-consistent-to period.

Lesson 5:

MATERIAL REQUIREMENTS PLANNING

The methods of aggregate planning as described in lesson 4 do not account for the detailed timing of material flows within the production system. The method of material requirements planning (MRP) was developed specifically for the purpose of dealing with the timing and inventory relationship in the discrete parts manufacturing environment. Fundamental to the MRP approach is the distinction that is made between independent and dependent demand as it effects inventory and production decisions. In this lesson 2, we examined several inventory models based on assumptions of either constant or statistical distributions of demand. In practice it is rare to find situations in which demand is constant, although this may be a good approximation where the variance to mean ratio (coefficient of variation) of demand is quite small. More often than not, demand for an item comes in lumps; that is, some units may be demanded during one period of time and then no demand will be for awhile. This is especially true within a discrete parts production facility. Demand for a particular raw material stock is needed only when that part goes into production. In a discrete parts production facility, in which there are typically 20,000 to 100,000 component parts. Hence inventorying based on a continuous demand model is inappropriate.

A statistical inventory model may be appropriate to describe final demand for the end products of the firm. End product demand is said to be independent demand, since it originates from independent sources outside the production system. However, the demand for subassemblies, component parts, and raw material stock is derived from the planned production levels of the end products. Once production planning determines the weekly master production schedule for end products, the requirements for subassemblies, components, and raw stock items related to those end products can simply computed. For this reason, it is

said that demand for these items are dependent to the production of final products.

The manufacturing routing sheets and product bills of materials describe the departmental routing and production times to manufacture the subassemblies and components. Using these data base in conjunction with a schedule of end product requirements, it is possible to compute the timing of production for each component to meet the given end product schedule. This, in effect, is what an MRP system does. In other words, given a master schedule of end (or final) product, MRP computes the timing of all the subassembly, component, and raw material production and purchasing activities required over the specified production horizon to meet the master schedule of the end product. Moreover, it does so in such a way as to attempt to minimize work-in-process inventory. The methods of MRP are not new. However, until recently, it has been economically impractical to employ these methods in any nontrivial production situation. The dramatic reduction in computer cost over the last 20 years has changed that circumstance. Thus, operating an MRP system requires massive data storage, retrieval and computational capabilities which can only be accommodated by computers.

WRITE TRUE (T) OR FALSE (F):

1) (…) MRP is a new method of inventory control.

2) (…) MRP is widely used in job shop layouts.

3) (…) The amount of buffer in MRP is very high.

4) (…) MRP computes the timing of all components over a horizon.

5) (…) MRP is used when there are many parts in the product.

CHECK THE CORRECT ANSWER:

1) MRP is very expensive to …….

a) Achieve b) perform

c) implement d) carry

2) A MRP model should contain……

a) Bill of material

b) Master production schedule

c) Timing table

d) all of the above

3) WIP means:

a) Work in process

b) Work in planning

c) While in process

d) all of the above

4) MRP is used when demand is:

a) dependent c) variable

b) Independent d) both a and c

5) MRP was developed so that production management can…….

a) Obtain a measure of control over the discrete parts production planning problem

b) Control forecasted production planning problem

c) Reduce work-in-process inventory

d) Both a & c

6) What does MRP need to be implemented?

a) Mainframe computer, technical professionals, MRP software

b) Mainframe computer, MRP software

c) Professionals, MRP software

d) Non of the above

7) What manufactures do instead of designing production control tools for a complex production system?

a) They hire experts for managing the system

b) They simplify hire the system

c) They try other ways of production

d) Non of the above

Fill in the blanks with appropriate word:

Performs- informative- updated- schedule- major- available

There are many commercially ……..software packages which provide of ……..reports. The …….components of the system are the master production…….., bill of materials and routing files, the inventory status file, and the MRP software that provides the logical and ……the computations. The bill of materials and routing files are ……as required through an engineering change module and inventory status is kept current by posting inventory transactions daily.

Read the following, and then choose the best answer:

The major problem with MRP systems is the integrity of the data. If there are any errors in the inventory data, the bill of materials (commonly referred to as 'BOM') data, or the master production schedule, then the outputted data will also be incorrect (GIGO: Garbage in, garbage out). Most vendors of this type of system recommend at least 99% data integrity for the system to give useful results.

Another major problem with MRP systems is the requirement that the user specify how long it will take a factory to make a product from its component parts (assuming they are all available). Additionally, the system design also assumes that this "lead time" in manufacturing will be the same each time the

item is made, without regard to quantity being made, or other items being made simultaneously in the factory.

A manufacturer may have factories in different cities or even countries. It is no good for an MRP system to say that we do not need to order some material because we have plenty thousands of miles away. The overall ERP system needs to be able to organize inventory and needs by individual factory, and intercommunicate needs in order to enable each factory to redistribute components in order to serve the overall enterprise.

This means that other systems in the enterprise need to work properly both before implementing an MRP system, and into the future. For example systems like variety reduction and engineering which makes sure that product comes out right first time (without defects) must be in place.

Production may be in progress for some part, whose design gets changed, with customer orders in the system for both the old design, and the new one, concurrently. The overall ERP system needs to have a system of coding parts such that the MRP will correctly calculate needs and tracking for both versions. Parts must be booked into and out of stores more regularly than the MRP calculations take place. Note, these other systems can well be manual systems, but must interface to the MRP. For example, a 'walk around' stock intake done just prior to the MRP calculations can be a practical solution for a small inventory (especially if it is an "open store").

The other major drawback of MRP is that takes no account of capacity in its calculations. This means it will give results that are impossible to implement due to manpower or machine or supplier capacity constraints. However this is largely dealt with by MRP II.

Generally, MRP II refers to a system with integrated financials. An MRP II system can include finite / infinite capacity planning. But, to be considered a true MRP II system must also include financials.

In the MRP II (or MRP2) concept, fluctuations in forecast data are taken into account by including simulation of the master production schedule, thus creating a long-term control. A more general feature of MRP2 is its extension to purchasing, to marketing and to finance (integration of all the function of the company), ERP has been the next step.

Questions:

1- What is the major problem with MRP systems ?
   a- integrity of material
   b- integrity of time
   c- integrity of the data
   d- all of the above
2- What are the basic needs of ERP system?

a- to be able to organize inventory.

b- needs by individual factory

c- to enable each factory to redistribute components in order to serve the overall enterprise.

d- All of the above

3) The major drawback of MRP is……

a) implementation b) hard to solve

c) production d) capacity

PUT THE FOLLOWING WORDS IN ORDER:

1) master- product-determined-production-once- a-schedule.

2) structure- is part- bill-foundation-system-of an-of material-the.

Lesson 6:

Project planning and scheduling:

6.1. A project is defined as a combination of interrelated activities that must be executed in a particular order to complete an entire task. Up the end of the nineteenth century, decision making was primarily dependent on the capabilities and experience of the managers.

The Gantt chart was the first scientific technique for project planning and scheduling. With the development of computers, new scheduling techniques came into existence. In the 1950s, network techniques of CPM (critical path method) and PERT (program evaluation and review technique) were developed concurrently. These two techniques are widely accepted and the use is well established in both service and industry. CPM and PERT are based on the assumption, that there are infinite number of resources available for the project's use at any point of time, therefore resource leveling and time-cost tradeoff must be performed. This restricts their use in many practical situations.

6.2. Project Planning and Scheduling: **Unlimited Resources**

Project management involves planning, organizing, staffing, controlling, monitoring and directing a project to its successful completion. These activities can be achieved optimally by using CPM and PERT.

6.2.1. CPM: Background

The critical path method (CPM) was developed by Kelley and Walker. It was used in the construction industry, where previous experience was the basis for time and cost estimates of the different phases of the project.

The basic feature of CPM is that it considers duration estimates over cost levels and as a result, provides a range of project durations with an establishment of the minimum cost for completing the project(crash cost). In brief, CPM could be described mathematically as a deterministic, digraphic (directed graph), longest path network model.

6.2.2**. PERT: Background**

The program evaluation and review technique (PERT) was developed in early 1950's as a joint effort of Booz, Allen and Hamilton and the U.S. Navy's Special Project Office as a research and development tool for the Polaris Missile project. With its use, this important project was completed approximately 24 months ahead of the originally scheduled completion date. The basic feature of PERT is the probabilistic estimation of activity times. A computational procedure calculates an estimate of project completion time. Therefore PERT could be described mathematically as a probabilistic, digraphic, longest path network model.

6.2.3 **GERT network**

GERT was developed by Pristker in 1970's. In these networks the time of each activity and the activity occurrence are probabilistic. It is widely used in production systems with scraps and rework, and preventive maintenance which the number of activities may not be definite.

6.2.4. **The use of CPM/PERT in industry**

In a survey conducted by Davis, among the top 400 construction firms in the United States, 80% of the respondent firms used critical path methods; however, not all users of the project networks were satisfied with the results. Davis noted that 16% of the construction firm's respondent in the survey reported that they had been unsuccessful in achieving the various advantages attributed to CPM, compared to 61% who reported "moderate success" and 15% who said they had been "highly successful".

In another survey, Gaither found that PERT and CPM ranked above all other quantitative decision-making tools in terms of the percentage of firms who used them. In sampling 500 companies located in seven south-central states, Gaither found about half of them using one or more operations research techniques; among those which did, 69% reported using PERT with 67% using CPM. The next most used tools were linear programming, 57%; statistical analysis, 56%; and computer simulation, 52%.

6.2.5 CONSTRUCTION OF PROJECT NETWORKS

Any project network consists of two basic elements, activities and events, which are controlled by a precedence relationship. Before analyzing the projects network, the following definitions and notations are introduced:

Activity: a time-consuming effort required to complete a necessary segment of the project network. All activities must begin and end with an event. Figure 6-1 shows a typical activity.

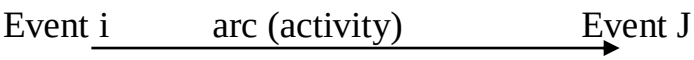


Figure 6-1 A-on-A representation

Event: a point of time signaling the beginning or completion of one or more activities. The event could also be defined as the point at which the successful completion of all preceding activities enables the dependent succeeding activities to start.

Precedence: a term that describes the relationship between two or more activities in the network.

Placing an activity in the network is based on following rules:

1. The precedence relationship between this activity and other activities.
2. Activities that could be done coincident with this activity
3. Activities that could start upon the completion of this activity

There are two modes of representation of activities in a project network: the activity-on-arc and the activity-on-node representation. These representations are now explained.

Activity-on-are representation (A-on-A): In this representation, activities are represented by arcs in the project network. An arrow is placed on the arc where the event (node) at the tail of the arrow represents the start of the activity and the event (node) at the head represents the termination (completion) of the activity. The description of an activity is written along the arc. Figure 6-2 shows a typical representation of an activity on arc.

In Activity on node (AON) representation, each activity is an event (node) which could be graphically represented as a circle, square, or other geometric figures; and numbers for identification, are written in the node.

The following characteristics must be taken into consideration when constructing the graphical representation of the project network:

1. The nodes (events) are numbered such that an arrow leads from an event with a small number to an event with a larger one.
2. Each node must have at least one arc leading into and one arc leaving it, with the exception of the first node (origin or source) and final node (terminal or sink).

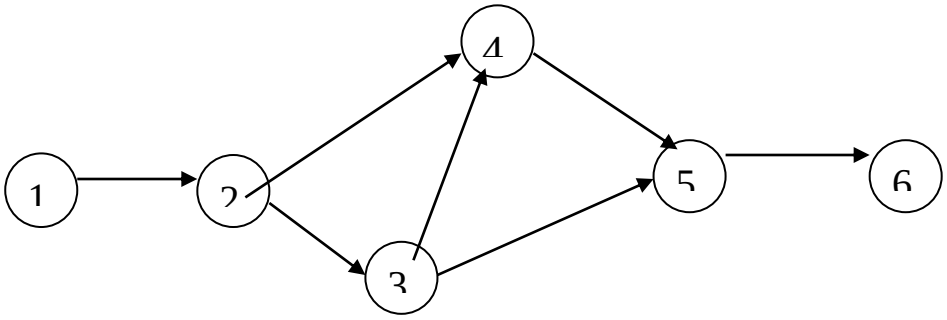


Figure 6-2 Example of an AOA networks

Activity floats are very impacts on managers in decision making on start of that activity's timing, which are as follows:

1) Total float; the maximum time that an activity postponed, so that total project time does not delay.

2) Free float; the maximum time that an activity postponed, so that does not affect the following activity.

3) Independent float; the maximum time that an activity postponed, so that does not affect all following activities.

4) Safety float; the maximum time an activity can postponed, so that does not affect the project's completion time if all preceding activities completed on latest finish time.

The other network models are:

1) Shortest path in a network

2) Maximal flow within a network
3) Minimal spanning tree

WRITE TRUE (T) OR FALSE (F):

1) (…) The Gantt chart was the first scientific technique in project planning and scheduling.

2) (…) CPM and PERT are based on that there is finite number of resources available for the project.

3) (…) The critical path method (CPM) was developed by Kelly and walker.

4) (…) CPM could be described mathematically as probabilistic, digraphic longest path network model.

5) (…) PERT could be described mathematically as deterministic, digraphic, longest path network model.

6) (…) The basic feature of PERT is the probabilistic estimator of activity times.

7) (…) In a survey conducted by Davis in the USA 100% of respondent use CPM and PERT models.

8) (…) Event, a point of time signaling the beginning or completion of one or more activities.

9) (…) There is one mode of representation of activities in a project network.

10) (…) The basic feature of CPM is the deterministic estimator of activity times.

CHOOSE THE BEST ANSWER:

1) The technique that was developed by Pritsker is:

a) Gantt chart b) CPM

c) PERT d) GERT

2) A network that is probabilistic, digraphic, longest path method is called.

a) Gantt chart b) CPM

c) PERT d) GERT

3) CPM and PERT are based on assumption that is …… number of ……. are available for the project.

a) finite-activities b) finite-resources

c) infinite-activities d) infinite- resources

4) A point of time signaling the beginning or completion of one or more activities is ……

a) activity b) event

c) Precedence d) b & c

5) The ……method was developed by Kelley and Walker.

a) CPM b) PERT

c) MRP d) GERT

6) Any project network consists of two basic elements,…… and …… which are controlled by a precedence.

a) Activities, events b) events, precedence

c) Activities, precedence d) none of them

7) A term describes the relationship between two or more activities in the network.

a) Event b) activity

c) Precedence d) a and c

8) A precedence relationship is usually written as ……

a) A = B b) A < B

c) A > B d) A ◁ B

9) Two models of representation of activities in a project network:

a) Activity on arc & event b) activity on arc & precedence

c) Activity on arc & activity on node d) activity on node & event

10) The …… was the first scientific technique for project planning and scheduling.

a) CPM b) PERT

c) GERT d) Gantt chart

Fill in the blanks place with the given words.

Optimally – precedence – Hamilton – Kelley – probabilistic - deterministic

Project management involves planning, organizing, staffing, controlling, Monitoring, and directing a project to its successful completion. These activities can be achieved ……. by using CPM and PERT.

The PERT was developed by ……and the basic feature of PERT is the ……..... estimation of activates times.

The CPM was developed by ..…… described mathematically as a ……, digraphic, longest path network method.

Any project network consists of two basic elements, activities and events, which are controlled by …….

Read the following, and then choose the best answer:

Project planning is part of project management, which relates to the use of schedules such as Gantt charts to plan and subsequently report progress within the project environment.

Initially, the project scope is defined and the appropriate methods for completing the project are determined. Following this step, the durations for the various tasks necessary to complete the work are listed and grouped into a work breakdown structure. The logical dependencies between tasks are defined using an activity network diagram that enables identification of the critical path. Float or slack time in the schedule can be calculated using project management software. Then the necessary resources can be estimated and costs for each activity can be allocated to each resource, giving the total project cost. At this stage, the project plan may be optimized to achieve the appropriate balance between resource usage and project duration to comply with the project objectives. Once established and agreed, the plan becomes what is known as the baseline. Progress will be measured against the baseline throughout the life of the project. Analyzing progress compared to the baseline is known as earned value management.

The inputs of the project planning phase include Project Charter and the Concept Proposal. The outputs of the Project Planning phase include the Project Requirements, the Project Schedule, and the Project Management Plan.

1- What is the input of the project planning phase include ?
   a- It includes Project Charter and the Concept Proposal
   b- It includes times of activities

c- It includes cost of activities
d- all of the above

2- Which one is the basic chart in project planning?
a- Gantt chart
b- from to chart
c- activity relation chart
d- assembly chart

PUT THE FOLLOWING WORDS IN ORDER:

1) relationship-project-represented-the precedence-network-directed-can be-of the-graph.

2) critical path-longest-network-project-of a-the-is the-through-the network.

Lesson 7:

Job sequencing and operations scheduling:

This lesson deals with the most detailed analysis and assigning production on machines. The lesson is divided in two main sections:

1) Job sequencing, in which machines process jobs such that some measure of performance is optimized; and

2) Assembly line balancing and transfer lines, where assembly operations are assigned to several work-stations along an assembly line to achieve equal balance between stations in order to increase the overall efficiency of the assembly line.

Job Sequencing:

The job sequencing problem is considered to be one of the most interesting problems in production analysis. It has received the considerable attention of researches. These problems are quite complex, and optimal solutions could be found for job sequencing problems with a small number of machines. However, optimal solutions for problems with a larger number of machines may not exist. In fact, it is impossible to check for optimality for such problems. Dudek et al. reported the results of an industrial survey which show that 57% of actual problems are of the job shop type, compared with 20% of the flow shop. They state that "a large portion of sequencing research deal with job shop problems utilizing make span (the length of completing all jobs) as the objective criterion. On the other hand, most industrial problems fall in categories of job shop with or without dependence between jobs and the schedulers are faced with satisfying a multiple number of criteria"..

The job sequencing problem can be stated as follows:

Given n jobs to be processed each has a setup time, processing time, and due date. In order to be completed, each job is to be processed at several machines. The goal is to sequence these jobs on the machines in order to optimize a certain performance criterion.

A typical list of performance criteria to be optimized is:

1. Mean flow time, or mean time in the shop
2. Idle time of machines
3. Mean lateness of jobs (lateness of a job is defined as difference between the actual completion time of the job and its due data)
4. Mean earliness of jobs (if a job is completed before its due data, lateness value is negative and it is referred to as earliness instead)
5. Mean tardiness of jobs (if a job is completed after its due data, then its lateness value is positive, and it is referred to as tardiness instead)
6. Mean queue time
7. Mean number of jobs in the system

8. Percentage of jobs late

The following factors serve to describe and classify a specific scheduling problem:

1. The number of jobs to be scheduled.
2. The number of machines in the machine shop.
3. Type of manufacturing facility (flow shop or job shop).
4. Manner in which jobs arrive at the facility (static or dynamic).
5. Criterion by which scheduling alternatives will be evaluated.

The first factor defines the exact number of jobs to be processed, time required for each process, and the type of machine needed. The second factor defines, the number of machines in the workshop, factor 3 describes the flow of jobs through the workshop.

The job arrival pattern is classified as either static or dynamic. In the static pattern, there are n jobs, each of which must be processed by a set of machines. All of the n jobs are available for processing at the initiation of the scheduling period, and no new jobs arrive during the period. In the dynamic pattern, jobs arrive intermittently according to a stochastic process. There might be two states:

1) Preempt resume indicates that all previous operations must be repeated for a product.

2) Preempt not resumed indicates that remainder of previous operation can be continued.

The fifth factor describes the use of one or more criterions that are mentioned earlier.

WRITE TRUE (T) OR FALSE (F):

1) (...) This lesson deals with the most detailed analysis including transportation.

2)(…) This lesson is divided into three parts: job sequencing, assembly fine balancing and operation scheduling.

3) (…) The job sequencing problem is not considered us an interesting problem.

4) (…) The job sequencing problem has received the attention of many scientists.

5) (…) Solving the problem of job sequencing would be a piece of cake.

6) (…) Optical solution could be found in order to solve job sequencing problem with a few number of machines.

7) (…) The optical solution for problems with a huge number of facilities does not exist.

8) (…) In job sequencing there are jobs are depended on setup time.

9) (…) Sequencing each job on the machines would be a good idea for optimization.

10) (…) For those jobs which are completed before their due time is referred to as tardiness.

CHOOSE THE BEST ANSWER:

1) When job sequencing is utilized?

a) In machines process jobs

b) In workers in charge

c) Both a & b

d) None of the above

2) In job sequencing problem, optimal solutions can be found ……..

a) by small number of machines

b) by large number of machines

c) by any number of machines

d) Non of the above

3) In order to optimize a certain performance criterion when n jobs that are given and each job should be processed at several machines it is required to…..

a) do jobs separately b) sequence jobs on the machines

c) take care number of machines d) none of the above

4) Which one is not the factors specific scheduling problem?

a) The number of jobs to be scheduled

b) The number of machines in machine shop

c) The time in which jobs arrive at the facility

d) The manner in which jobs arrive at the facility (static or dynamic)

5) If the flow of jobs is continuous and the jobs require the same sequence of machines, we have a …….

a) flow shop pattern b) job shop pattern

c) group technology pattern d) none of the above

6) In situation where there is no common pattern for the flow of jobs through the shop, we have a …….

a) flow shop pattern b) job shop pattern

c) group technology pattern d) none of the above

7) What is the percentage of problems of job shop type?

a) 20% b) 48%

c) 57% d) 65%

8) The job arrival pattern is classified as …….

a) Static b) dynamic

c) Either static or dynamic d) non of them

9) In static pattern which one is right?

a) The new jobs can arrive during the period

b) No new jobs arrive during the period

c) The arrival of new jobs depends on time of arrival

d) None of the above

10) In dynamic pattern which …….?

a) Jobs arrive intermittently

b) Jobs do not arrive intermittently

c) Jobs are fixed

d) Non of the above

Fill in the blanks with appropriate word:

Time- current- job-existing- worked- very

The scheduling problem is ……complicated in the case of the dynamic …….arrival pattern. In this type of scheduling problem, a schedule for the …….set of jobs is produced, and as this schedule is being ……..through, new jobs arrive at the shop. The two extreme scheduling procedures are: to produce a new schedule each …….a new job arrive, or to finish the …….schedule

completely before producing a new schedule for the jobs that have arrived since the current schedule began.

READ THE PASSANE AND ANSWER THE QUESTIONS:

A job scheduling problem is very complicated in the case of the dynamic job arrival pattern. In this type of scheduling problems, a schedule for the current set of jobs is produced, and this schedule is being worked through, new job arrive at a shop. The two extreme scheduling procedures are: to produce a new schedule each time a new job arrives, or to finish the existing schedule completely before producing a new schedule for the jobs that have arrived since the current schedule began. Alternatively, a solution some where between these two extremes is a possibility. Ignoring computational considerations, the best approach may be to have an on-line system whereby every time an operation finished on a machine and that information is fed in the computer, a new job is selected to be processed on that machine. The computational time is tremendous and in many cases it is not economically feasible.

1-The main objective of this passage is:

a) The complexity of dynamic job arrivals

b) The role of computers in soling dynamic job arrivals

c) The different job scheduling problems

d) all of the above

2- Tremendous means:

a) very high c) very expensive

c) very much d) very

PUT THE FOLLOWING WORDS IN ORDER:

1) some technique-now-we-optimization-sequencing-problems-summarize-used for.

2) the-machines-of the-and-uncertainty-failure-processing time-if-rates-are-considered-it-formidable-becomes.

Lesson 8:

Kanban production control:

Throughout the text we have emphasized the relevance of production control techniques to the specific system under consideration. This is especially true in lessons 4 and 5, in which we contrast planning methods in the relatively simple product layout facility for mass production versus the relatively complex process layout plant for discrete-parts production. The control vehicle in the latter case is the MRP system with capacity and shop floor planning aids. MRP was developed so that production management could obtain a measure of control over the discrete parts production planning problem and also reduce work-in-process inventory. However, there are drawbacks to MRP in that it is very expensive to implement, requiring the capability of a mainframe computer, technical support professionals, and MRP software. This has led some manufactures to take a contrary approach: instead of designing production control tools for a complex production system, they simplify the system. By so doing they minimize the difficulty of the problem in production control.

In some cases, these new directions simplify or eliminate existing problems; in other cases, create new and challenging ones.

Kanban was developed in Japanese manufacturing, the best-known example being the Takahama plant of Toyota in Japan. Since then it has been adapted by some manufactures. As practiced at Toyota, the Kanban production system is a non computerized card production control system that works from a master schedule; just as an MRP system does. However, there are significant differences in the form that the master schedule takes as well as the way in which the production plan is executed.

An important difference occurs in production lot sizing. In computing production lot sizes, as described previously in this text, one tries to balance setup and holding costs. When machine setup cost is high, which is typical in batch metalworking operations, this encourages relatively long production runs

of a given product. Relatively long production runs implies long production lead times in the system and consequently, more in-process inventory that to be monitored and to be controlled over a longer period of time.

Kanban is a card system that emphasizes the reduction in production lead time and inventory by specifying shorter production runs and fewer production of any single product.

WRITE TRUE (T) OR FALSE (F)

1) (…) Kanban was developed in Japanese manufacturing.

2**)** (…) Kanban works from a master schedule.

3) (…) Kanban is a computerized system**.**

4) (…) Kanban causes more work in process inventory.

CHOOSE THE BEST ANSWER:

1) The main difference in Kanbun with traditional methods is……

a) lot size b) frequent set up

c) fast delivery d) all of the above

2) Long production run implies…….time.

a) more b) less

c) equal c) non of the above

Fill in the blanks place with the given words.

Adapted	**significant**	**developed**
Executed	**no computerized**	**reduction**

KANBAN was ……. in Japanese manufacturing and it has been ……. by some American manufactures. As practiced at TOYOTA, the KANBAN production system is a ……... production control system that works from a master schedule, just as an MRP system does. However, there are …… difference in the form that the master schedule takes as well as the way in which the production plan is …….. KANBAN emphasis the …… un production lead time and in-process inventory by specifying shorter production runs of any single product.

ANSWER THE FOLLOWING QUESTIONS:

Inventory level and operations scheduling in Kanban system are driven by a set of cards, called Kanban cards. There are two kinds of Kanban cards used by Toyota, the requisition and the production card. The requisition card authorizes withdrawal of material by an operation from a lower operation that feeds it. A

production card authorizes the feeding operation to produce more of what is being requested.

1) The main objective of this passage is:

a) introduction of Kanban inventory system

b) Procedure of Kanban operation

c) Toyota co. was very successful in this type of operation

d) upper and lower operation of Kanban

2) requisition means:

a) order b) receive

c) control c) schedule

PUT THE FOLLOWING WORDS IN ORDER:

1) operations-inventory-levels-scheduling-system-in a-are driven-Kanban-and-Kanban cards-is called.

2) conflicts-management-arises-when-is applied-judgment.

Lesson 9:

FMS AND GROUPE TECHNOLOGY

A flexibility manufacturing system (FMS) consists of a group of processing stations mainly by the use of CNC machines, an automated material movement and storage system, which is controlled by an integrated computer system. FMS is a general purpose manufacturing machines, which are quite versatile and capable of performing different types of operations linked together by an automated material handling systems. FMS rely on cell and group technology approach in production designs.

The term cell refers to machine grouping that consists of either manually or machine operated. For cellular manufacturing to be effective there must be group of items that have similar processing characteristics. These items must be identified and this grouping process is known as group technology and involves identifying items that have similarities in either design characteristics (size, shape, function) or manufacturing method and grouping them into part families. Once similar items have been identified, items can be classed according to their families, and coding system can be developed. These coding facilitate retrieval from data base for the purpose of manufacturing.

Every layout design has some advantages and disadvantages. GT is a type of layout that has the advantages of both flow and job shop layout.

WRITE TRUE (T) OR FALSE (F):

1) (…) For cellular manufacturing to be effective there must be groups of items that have similar processing characteristics.

2) (…) Items can be classified to either families and coding system.

3) (…)The coding facilitates data retrieval for purpose of manufacturing.

Choose the best answer:

1) GT is applicable to:

a) Batch production system

b) Job shop production system

c) Fixed production system

d) Continuous production system

2) In GT layout, the machines are arranged in semi-flow to minimize …….. and waiting problem.

a) machine effectiveness b) transportation distance

c) production output d) common operation

3) Production flow analysis is a technique……. The operation sequence and work stations in a plant.

a) to analyze b) to exist

c) to produce d) to manufacture

4) Parts with similar routes and operations are identified as …….

a) visual search b) flow analysis

c) part family d) coding system

5) In GT, involves arranging items into groups according to some principle or system.

a) classification b) application

c) implementation d) operation

Fill in the blanks with appropriate word:

degree- establishes- reduces – organized- stable

The primary drawback in exchanging a traditional process layout for group technology is the loss of flexibility. Since GT cells are ……around a specific group of components, machines are no longer interchangeable. Thus a reasonably …….product mix is required to ensure an economically viable ……..of cell utilization. A primary benefit of GT implementation is the foundation it …….for the application of automation. Group technology……. the variability in components geometry that is routed through any particular set of machines.

Read the following and choose the best answer:

Group technology is generally considered to be a manufacturing philosophy or concept that identifies and exploits the similarly of parts and operation process in design and manufacture. In both type of manufacturing each part has traditionally been treated as being unique in design, process planning, production control, tooling, production, and so on. However by grouping similar parts into part families, based on either geometric shapes or operation process if possible, forming machine groups or cell that process the designated part families, it is possible to reduce costs through more effective design rationalization and design data retrieval, fewer stocks and purchases simplified and improved process planning, control, reduction of tolling and setup time, semi-flow line production by machine group or cell, less in-process inventory, reduction of NC programming centers, and so on.

1) GT identifies……

a) Similarity of parts b) similarity of production process

c) Similarity of parts and operation process d) none of the above

2) GT is a development which continues to expand its influence……..system.

a) Conventional b) manufacturing

c) Geometric shapes d) conceptual

2) For many years, the concept of GT was practiced as part of ……

a) Tooling device b) scientific management

c) Good engineering practice d) both a and c

4) GT is generally considered to be a manufacturing system that identifies and exploits the sameness or similarly of parts and operation process in …….

a) Design and manufacture b) utilization

c) tradition d) designation

PUT THE FOLLOWING WORDS IN ORDER:

1) the-of setup time-lead time-influence-reduction-and-is applied.

2) reduced-defective-percentage-parts-occurs-of the.

Lesson 10:

Facility layout design:

The layout of a facility deals with the physical organization and interrelationship of equipment and people in a production or service process. Facility layout is dependent upon such process design considerations as resource availability, demand, and capacity. Once the production process is defined as a line flow, job shop, or fixed project, further decisions can be made with regard to the physical layout of the production or service process.

Similarly, the layout of a facility, and the decision to change a layout design, are closely related to the criteria by which an operation is evaluated. In fact, the layout contributes to productivity, which is measured in terms of cost, quality, quantity, flexibility, and delivery.

Layouts can be designed to achieve productivity in many different ways. A layout supports productivity by minimizing or eliminating material travel, or by using gravity or other mechanical efficiencies to move heavy products. For example, in the assembly of components, lighter-weight components are often assembled on the upper floors of a multilevel facility, and the product is moved downward as it gains weight. This method reduces the need to move heavy or bulky objects.

In other situations, the reduction of employee or customer movement may be the key to a good layout design. Many large airports, for example, are designed around somewhat circular shape. By using the inside circumference of the hubs and spokes for traveler movement and by placing taxiways and runways near the outer circumference, therefore traveler walking distance are reduced. Similarly, in a manufacturing environment, manufacturing cells often involve U-shaped lines that permit workers to move more rapidly from one process to another.

The third facet of facility layout design involves the sequencing or interrelatedness of specific activities. Manufacturing process often relies upon the sequencing and timing of tasks (e.g., the application and drying time of glue

or paint). Similarly, with a computer and software installation or a comprehensive consulting job, this sequencing and interrelatedness of activities and human resources can closely be managed.

This lesson will introduce the basic concepts of facility layout and then address the measures of effectiveness of process layout, product line layout, and fixed position or project layout. Throughout the discussion, measured production performance is a central consideration, yet that is difficult to be operational, and almost impossible to optimize. This is because numerous assumptions, constraints and methodological conveniences are often required to permit the evaluation of facility layout.

The issues of facility layout vary depending upon resource and capacity decisions, facility locations, the production process selected and the criteria by which productivity is measured. The planning and decision process for layout evaluation must take all of these factors into consideration. Facility layout is thus defined as follows:

A planning process that considers alternatives of resource utilization, facility location and process design often through the use of mathematical algorithms, for the purpose of greater productivity, quality, quantity, cost, flexibility, and delivery.

The key points of the definition are briefly highlighted in the following discussion.

Planning process:

Facilities layout evaluation and implementation is a planning process. The planning process has four setups: inquiry, information input, evaluation and updating. These setups are all considered in facilities layout evaluations, although the emphasis of these steps, when applied to layout planning, may be more specific alternatives. After the general resource utilization, facility location, and process design approaches have been selected, specific site design alternatives are evaluated, including resource movement patterns, types of

equipment, labor skill levels, and contingencies for emergency action, safety and maintenance.

There are two main viewpoints in planning layout design:

1) Plan according to the process that the product must be manufactured. And,

2) Plan according to the manner of product movement's.

Mathematical algorithms of layout planning:

Such tools are often used to evaluate a particular layout pattern prior to implementation. The algorithm permits the operations manager to model or simulate each alternative without incurring extensive setup costs to test the process. In this manner, one or several of the more efficient designs may be selected for additional testing. The use of algorithms permits low-cost focusing of the solution process toward several of the more cost-effective alternatives.

Purpose of layout analysis:

Layout analysis is used to increase process productivity through better integration of facilities and other resources.

Recent Developments in Facilities layout techniques: The three traditional production processes were identified as the line (product), job shop (process) and fixed position (project) approaches. Subsequently a variety of recent developments, such as manufacturing cells and flexible manufacturing systems (FMS), through the use of robotics, were suggested as ways of integrating or mixing these processes and using the best characteristics of each.

Commonly involved factors or considerations in layout planning are:

1) Ease of future expansion

2) Flexibility of layout

3) Material handling effectiveness

4) Space and equipment utilization

5) Safety and housekeeping

6) Working condition

7) Ease of supervision

8) Appearance

9) Fit with company's organization structure

10) Ability to meet capacity or demand

11) Investment or capital required

12) Saving, return profitability

13) Closeness to raw material and market

Type of layout is very dependent upon:

1) Size and shape of the land

2) Access to main road

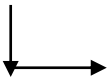
3) Ease of control and labor's movement

4) The numbers of warehouse's need

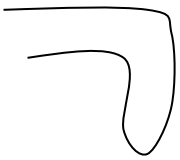
5) Type of manufacturing

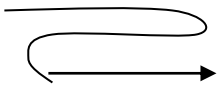
Types of layout patterns:

a) Straight linear or I Flow 

b) L Flow 

c) U Flow 

d) Circular Flow 

e) Serpentine or S Flow 

Distance planning:

Distance planning is either Euclidean (straight line) which is used for new design layouts or rectilinear (Rectangular) distance which is used for existing layouts.

Charts used in facility layout:

1) Assembly chart which is used to identify part need's for a product

2) Operations process chart which is for specifying operations sequence and inspection positions

3) Route sheet is a table that shows the equipments, accessories, standard time of each operation

4) Flow process chart is used for sequence of all activities required to complete a task

5) Man-Machine chart shows the interaction between men and machines and their percent effectiveness in one cycle

6) Activity relationship chart is used for qualitative layout planning

7) From-to chart is used for quantitative layout planning

Computer packages in facility layout:

The computer packages used in layout planning are either constructive, or improving. CRAFT (Computerize relative of facilities technique) is improving, and CORELAP, ALDEP are constructive computer packages.

WRITE TRUE (T) OR FALSE (F):

1) (…) Layout facility only deals with physical organization of equipments in a production process.

2) (…) Layout of a facility is designed to achieve greater productivity.

3) (…) The layout pattern depends upon shape of land.

4) (…) The OPC considers men's movement.

5) (…) Layout designs always give optimal solution.

6) (…) Layout analysis is necessary for all production layouts.

7) (…) Manual calculation is sufficient for layout analysis.

Check the correct answer:

1) Layout of a facility contributes to …….

a) Process b) criteria c) flexibility d) productivity

2) The method that reduces to raise bulky object is the use of…..

a) Environment b) gravity c) human d) all of the them

3) The U- shaped pattern, permit workers to move……. from one process to another.

a) slowly b) constantly c) rapidly d) none of these

4) The productivity is measured in terms of …….

a) Cost b) quality c) flexibility d) all of these

5) The facility layout is very depending upon……..

a) Resources b) capacity c) facility location d) all of them

6) Systematic Layout Planning (SLP) is.

a) An approach used in all plants.

b) A planning method of organization.

c) Associated with the development by Muther.

d) A systematic method of planning the layout.

7) A product layout flow is needed for operations involving …….

volume of ……products.

a) Small, similar b) Large, different

c) Small, different d) large, similar

Read the following passage, and then choose the best answer:

What is flexibility?

Ten to 15 years ago, quality was much like flexibility as is today: Vague and difficult to improve, yet difficult to competitiveness. Since then, managers and academics have studied and experimented with ways to improve quality; as a result, there is currently an enormous variety of quality improvement techniques. Flexibility is the only beginning to be explored, if managers aim to improve plans.

The first problem is one of definition. Flexibility means different things to different people. At the plant level, flexibility is about the ability to adapt or change. But there are many ways to characterize such ability. One manager might be talking about the cost of changing from one product to the next. Another might be talking about the ability to ramp production volumes up and down to fit the market. Yet another might be talking about the ability to increase the range of very different courses of action to develop. The type of flexibility a given company should emphasize should be determined by its competitive environment. Whether one is referring to products, production volumes, or manufacturing process, flexibility is about increasing range, increasing mobility, of achieving uniform performance across a specified range. Product range can mean different things. For example, a plant can have the ability to make a small number of products that are very different from one another, or it can have the ability to produce concurrently large number stock-keeping units that are only slightly different from one another. Mobility means a plan's ability to change nimbly from one product to make another. It is this kind of flexibility that is associated with quick response times-mobility minimizes the need for long runs and allows production to follow demand without excessive inventory.

1) According to the passage; flexibility
   a) Is like quality today
   b) Is vague and difficult due to competitiveness
   c) Is being studied and experimented with like quality was 15 years ago
   d) All of the above
2) Flexibility:
   a) Has different meaning for different people
   b) Means ability to adapt and change
   c) Means changing of product, volume, and range of products
   d) All of the above
3) Flexibility refers to:
   a) Production volume and products
   b) Manufacturing, products
   c) Increasing range, mobility and getting consistent performance over a given range

d) All of the above

4) Product range concept means:
   a) The spread in variety of few products
   b) The spread in number of products with few and different
   c) Both a and b
   d) Span of the product

5) Mobility in the passage refers to:
   a) The movement of product in the production process
   b) Minimization of product in pursuit of demand
   c) Quick shift from a product to another
   d) Both b and c

PUT THE FOLLOWING WORDS IN ORDER:

1) number of- from to-between-shows-trips-departments-chart.

2) REL-in much-way-same-from to-as-chart-be used.

Lesson 11:

Work measurement:

Work design, is concerned with properly specifying work tasks for each employee in order to gain the greatest productivity, efficiency and worker satisfaction, once job tasks have been precisely defined. Work measurement is divided in two subjects: motion and time study.

Motion Study

The detailed evaluation of employee work actions is called a motion study and is conducted by a methods analyst. The objectives of a motion study are to improve work methods in order to make the task easier or safer and to increase quality and productivity. Motion studies evaluate work methods, workstation layout, and employee motions. Modern motion studies can be traced to Frederick Taylor (1911) and Frank and Lillian Gilbert (1917). They observed the differences between methods employed by neophyte apprentices and those used by experienced journeymen. It was obvious that the journeymen were faster, but, with further study it became apparent that the journeymen's speed resulted from improved motion patterns. Taylor and the Gilberts examined many activities to increase efficiency through improved work methods. Such motion studies attempted to eliminate unnecessary and harmful movements. Evaluation of the motion economy is normally the first setup of a motion study.

MOTION ECONOMY PRINCIPLES: Over the years many principles of motion economy have been developed. Through these principles, the motion analyst ensures that the movements are efficient and necessary. The motion economy constitutes three subjects: 1) relation to human body movements 2) relation to work environment and 3) relation to jigs, fixtures and equipment usage and placement.

PROCESS CHARTS: Process charts are schematic models used to evaluate motion economy; they formalize the existing work method and assist in planning improved procedures. Among the principal types of process chart are

the assembly chart, operations process chart, flow process chart, right and left-hand chart, man-machine chart, simultaneous motion (SIMO) chart and Gang chart. The assembly process chart shows the parts and their complexity for a product. The operations process chart, sometimes called the "Gozinto" chart (Figure 11-1), identifies the operations, their sequencing and their relationships. The flow process chart shows the time, distance and handling manner of a product, right- and left-hand charts shows the interaction of both ands for an operation, man-machine charts, and simultaneous motion charts all concerned with the operator. These charts and diagrams highlight potential areas of methods improvement.

Time study: refers to a subject of work measurement procedures used where human endeavor (rating) involved in the productive act, then some procedure is used to adjust the human time to some concept of standard level, plus the allowance percentage. The resulting coefficient from any of the procedures is called a standard time. There are three main methods of obtaining standard time:

1) Predetermined time system such as MTM, and MOST family

2) Stopwatch system

3) Sampling plan

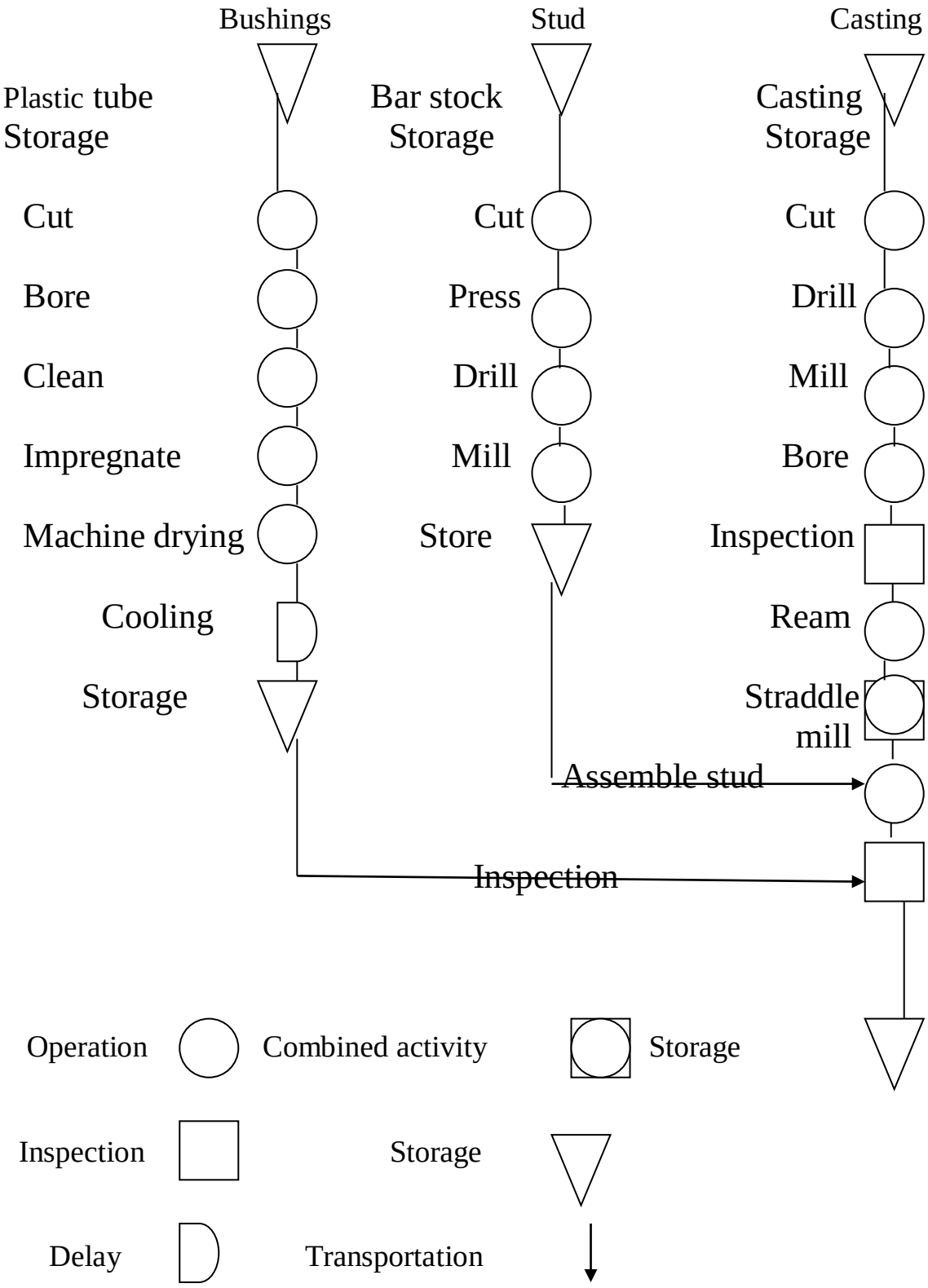


Figure 11.1

Fill in the blanks with appropriate word:

1) Motion economy is the …… of people.

2) The motion analyst ……. ….that the movements are efficient.

3) Gozinto chart, identifies the ……... , their ….…. and their relationship .

4) Frank and Lillian Gilberts observed the differences between methods employed by ……. apprentices.

WRITE TRUE (T) OR FALSE (F)

1) (…)The detailed evaluation of employee work action is called a motion study.

2) (…) The objectives of a motion study are to improve work methods.

3) (…) Motion study only evaluates work methods.

4) (…) Taylor and Gilberts examined many activities to decrease efficiency.

5) (…) Evaluation of the motion economy is the first step of a motion study.

CHOOSE THE BEST ANSWER

1) Process charts are schematic models used to evaluate motion …….
a) Study b) economy c) understanding d) analysis

2) Evaluation of the motion economy is the ….. Step of a motion study.
a) first b)second c)third d)another

3) The assembly chart is very similar to ……..
a) SIMO b) flow process
c) OPC d)right left hand chart

4) The flow process chart shows the …… and … .
a) Distance – economy b) timing – distanc
c) Timing- economy d) Both a and c

5) Motion studies evaluate ……
a) Work methods b) work station layout
c) Employee motion d) All of the above

Read the following, and then choose the best answer:

Fundamental purpose behind measures is to improve performance; numbers of measures that are not directly connected to improving performance (like measures that directed at communicating better with public to build trust) are measures that are means to achieving that ultimate purpose. (Behn 2003)

Behn in 2003 gives eight reasons for adapting performance measurements:

The first reason is to Evaluate how well is public agency performing. To evaluate performance, managers need to determine what agency supposed to accomplish (Kravchuk & Scheck 1996). Then formulate a clear, coherent mission, strategy, and objectives. Then based on this information choose how you will measure those activities. (You first need to find out what are you looking for).

The next one is to Control how managers can ensure their subordinates are doing the right thing.

Today managers do not control their workforce mechanically (measurement of time-and-motion for control as during Taylor). However managers still use measures to control, while allowing some space for freedom in the workforce. (Robert Kaplan & David Norton) Business has control bias. Because traditional measurement system sprung from finance function, the system has a control bias. The other is to Budget Budgets are crude tools in improving performance. Poor performance not always may change after applying budgets cuts as disciplinary actions. Sometimes budgets increase could be the answer to improving performance. Like purchasing better technology because the current ones are outdated and harm operational processes. So decision highly influenced by circumstance, you need measures to better understand the situation.

Another is to motivate people and give significant goals to achieve, and then use performance measures including interim targets- to focus people's thinking and work, and to provide periodic sense of accomplishment, next is to Celebrate Organizations need to commemorate their accomplishments- such ritual tie their people together, give them a sense of their individual and collective relevance. More over, by achieving specific goals, people gain sense of personal accomplishment and self worth (Locke & Latham 1984).

Then is to Promote How can public managers convince political superiors, legislators, stakeholders, journalists, and citizens that their agency is doing a good job.

(National Academy of Public Administration's center for improving government performance- NAPA 1999) performance measures can be used to: validate success; justifying additional resources; earn customers, stakeholder, and staff loyalty by showing results; and win recognition inside and outside the

organization. Indirectly promote competence and value of government in general.

After that is to Learn Learning is involved with some process, of analysis information provided from evaluating corporate performance (identifying what works and what does not) . By analyzing that information, corporation able to learn reasons behind its poor or good performance, And finally is to Improve What exactly should who- do differently to improve performance? In order for corporation to measure what it wants to improve it first need to identify what it will improve and develop processes to accomplish that.

Also you need to have a feedback loop to assess compliance with plans to achieve improvements and to determine if those processes created forecasted results (improvements).

Improvement process also related to learning process in identifying places that are need improvements.

1- What is the fundamental purpose behind measures?

a- To improve performance

b- To improve number of measures that are not directly connected to improving performance

c- To improve number of measures that are directly connected to improving performance

d- None of the above

2- How many reasons Ben 2003 Gives for adapting performance measurements?

a- six b- seven

c- eight d) nine

PUT THE FOLLOWING WORDS IN ORDER:

1) affect-unavoidable-allowance-delay-and-fatigue-how much-an- employee.

2) time studies-elements-data base-check-the-for-these-on.

Lesson 12:

Human factors engineering:

Everything designed is ultimately for the use of men. To ensure safe and efficient use of equipment, engineering design and layout design should take into account man's capabilities and limitations. Engineering design is concerned with height, length, ease of use, repair and maintenance, maintainability, and performance, and layout design is concerned with color, height, closeness comfort, and lighting.

Human factors engineering embraces a broad approach with focus upon man's sensory input, motor response output and information processing characteristics and their interaction with environmental conditions and system function requirements. System function must be allocated effectively to man and machine. The human factors engineer's task is to define human performance requirements and ensure that these are not compromised by improper equipment design and layout.

Industrial engineering has been concerned with the relation between men, machines, and materials and accordingly has evolved effective methodology for dealing with problems of operator efficiency and workplace layout. A field born in the late 1940s, human factors engineering has potential for complementing traditional industrial engineering approaches.

Check true or false:

1) (…) Human factors engineering embraces a broad approach with focus on man's sensory input and output in a process.

2) (…) Human factors engineering is concerned only with man and machines.

3) (…) The field of human factors engineering born in 1950's.

Choose the best answer:

1) A human error may be traced to ……..

a) Poor equipment design b) Poor design engineering

c) Failure of operator d) all of the above

2) During the early studies of human error there arose a demand For personnel who could give attention to man's ….characteristics.

a) Biological b) psychological

c) Biomechanical d) all of the above

3) A human factors team may involve……

a) Design engineering

b) Experimental and applied psychologists

c) Physical anthropologists

d) all of the above

Fill in the blanks with appropriate word:

Unassisted, jumping, perform, inherent, reliably

Designers must recognize people's limitations and should not expect people to ……beyond their ability. For example, any high jumper will have great difficulty……. higher than 9 feet. This type of physical limit seems ……and fairly obvious. If a designer built a system that required people jump……. over 9 feet wall, the system would be inoperable and fail. The failure even may be blamed on faulty human performance. But we cannot expect people to ……..perform beyond limits.

Read the following, then choose the best answer:

Human Factors Engineering (HFE) is the discipline of applying what is known about human capabilities and limitations to the design of products, processes, systems, and work environments. It can be applied to the design of all systems having a human interface, including hardware and software. Its application to

system design improves ease of use, system performance and reliability, and user satisfaction, while reducing operational errors, operator stress, training requirements, user fatigue, and product liability. HFE is distinctive in being the only discipline that relates humans to technology.

Human factors engineering focuses on how people interact with tasks, machines (or computers), and the environment with the consideration that humans have limitations and capabilities. Human factors engineers evaluate "Human to Human," "Human to Group," "Human to organizational," and "Human to Machine (Computers)" interactions to better understand these interactions and to develop a framework for evaluation.

Human factors engineering activities include: 1. Usability assurance 2. Determination of desired user profiles 3.Development of user documentation 4.Development of training programs.

1- Human Factors Engineering can be applied to the design of all systems of …….

a- machine interface
b- human interface
c- hardware interface
d- software interface

2- What are the activities of human factors engineering?

a- Usability assurance

b- Determination of desired user profiles

c- Development of user documentation

d- all of the above

3- This passage is about……..

a- Human factors principals

b- Human factors procedures

c- Human factors distinction

d- All of the above

PUT THE FOLLOWING WORDS IN ORDER:

1) work- sampling-establish-validate-criteria-use-to-hiring.

2) worker-affect-potentially-stress-that can-social-physical-and.

Lesson 13

THE PHILOSOPHY OF EXCELLENCE:

Several contemporary developments have challenged traditional methods of managing operations processes. Just-in-time (JIT) inventory management, total quality control (TQC), and scheduling efficiency through enhanced scheduling technologies (EST) have been shown to notably improve process efficiency over traditional methods because of faster throughput and better resource management." Although the results are not always conclusive, the success of methods has encouraged many firms to implement or consider implementing JIT and related techniques." (Celley et al. 1986)

Although the planning and implementation of these techniques takes much time and effort, many projects can result in notable cost savings. For example, a survey of 66 JIT implementations (Dilworth 1987) found performance improvement resulting from process changes, reduction of organizational layers, increased teamwork, and lower inventory levels. Similar results were reported by Cincinnati Milacron Electronic Systems Division, achieved a 27 percent space saving, 68 percent overall inventory reduction, lot size reduction of 50 percent, and an increased productivity level of 36 percent in roughly 18 months. At the same time, the cost of quality decreased from 19 percent of the cost of goods to 14 percent as a statistical process control system was implemented (Powell 1987).

Many of these contemporary ideas are popularly associated with Japanese manufacturing methods; however, most are just good operations management practices of long standing and are quite international. The Japanese took operations management principles seriously and have applied them diligently. However, in search of excellence, Peters and Waterman (1982) document numerous examples of American development of these contemporary methods; including the 48-hour guaranteed worldwide service parts delivery policy of Caterpillar Tractor. Similarly, numerous European firms have adapted or internally developed these methodologies. Contemporary process control

methods have been developed out of necessity by many international firms in pursuit of competitive excellence.

JIT, TQC and EST appear to challenge many traditional practices of manufacturing and service operations, such as maximum equipment utilization, economic order quantities, lot sizes, and some aspects of materials requirement planning, distribution management, line balancing, queuing theory, operations scheduling, quality control, cash flow and budgeting, repair and maintenance and management information system. These contemporary techniques are highly consistent with the basic logic of traditional methods. As such, JIT, TQC, and EST collectively represent a substantive growth in our knowledge of how to better manage production processes.

The definition of JIT:

JIT embodies a philosophy of excellence to establish demand-pulled versus push- inventory practices that produce to design specifications at a rapid but smoothed delivery rate with zero idle inventories, zero unnecessary lead times, and increased employee involvement in the process.

The important aspects of this definition discussed in the paragraphs that follow. Note that this is a rather abstract or pure definition. Many firms are applying JIT; others apply some aspects of JIT consistent with their operational environment system. The definition of JIT is as follows:

Produce to the demand Pull:

In a pure JIT process, products are not manufactured unless there is a clearly defined order. Component parts are produced as they are required for finished goods, and finished goods inventory are closely controlled. JIT assumes that production costs are best recovered by rapid delivery of the product. Additionally, capacity is viewed as a sunk cost; and it is not a consideration in operations process decisions.

Produce to the Design Specifications: Very tightly enforced quality control processes ensure that the product is exactly as specified by the product design or

customer requirements. JIT implies a zero defects quality control effort that is total quality control (TQC).

Produce to a Rapid but Smoothed Delivery Rate:

The production process is smoothed so that there is little wasted energy or delay. Products move rapidly and consistently through the production process. To hold an order that requires a minimum lot size for production efficiency would mean sacrificing delivery time and possibly a loss of business; this would be unacceptable under JIT. Reduction of setup times reduces the minimum economic lot size, with the ideal being an economic lot size of one.

Zero Idle Inventory Holdings:

Inventories are not produced until they are demanded by the next step of the production process or to meet minimal finished good stock requirements.

In JIT system, employers would prefer that an employee sit and do nothing rather than produce part that was not immediately required. In practice, this time often is used for equipment cleaning and maintenance, methods improvements, and similar activities. Although the firm must bear the cost of unproductive labor, it does not bear the additional costs of energy and machine wear in production, changes in product specification, material costs, or potential confusion due to high inventories. This rapid and smooth flow suggests zero idle inventories and zero unnecessary lead time.

Encouraging Employee Involvement:

Direct employee involvement is the only way that myriad of process control details and process improvements can he handled. This gives employees an opportunity for personal development and growth. For this reason, JIT often requires extensive employee training, through communication within the plant, and extensive interaction with suppliers, employee flexibility and involvement with larger segments of the production process are also usually required. This is a time consuming long-range process that *requires* the employee's commitment.

Thus, JIT encourages management methods that allow for employee development.

The Characteristics and Tools of JIT

The philosophical approach of a JIT system is very different from traditional process control approaches. To achieve a successful JIT implementation, a number of different characteristics of the manufacturing process must be considered and monitored by management. These characteristics and tools, several of which are unique to JIT implementations, are listed in Table 20-1 and discussed in the following paragraphs.

Small inventories: Large inventories are regarded as a costly liability. Companies with a JIT system report that inventory turns a relative measure of inventory investment, frequently the rate of annul cost of sales to inventory investment may increase from two or three turns per year to 25 or more turns per year under JIT. The following illustrates JIT characteristics and tools.

JIT Characteristics	JIT tools
Low inventories	Modular product design
Fast setups	Good housekeeping
Small lots	Visible information Displays
Frequent delivery	Apply Kanban
Flexible labor	
Flexible equipment	
Consensus management(TQM)	
Integrated technical	
Support & vendors	

The characteristics and tools of JIT

WRITE TRUE (T) OR FALSE (F):

1) (…) JIT assumes that production costs are best recovered by rapid delivery of products:

2) (…) JIT assumes that; capacity is a sunk cost in operation process decision.

3) (…) JIT implies a zero defects quality control effort.

4) (…) To hold an order is acceptable under JIT.

5) (…) When the firm must bear the cost of unproductive labor, does not have the additional cost of machine wear in the production.

6) Encouraging employees gives an opportunity for personal growth interaction with supplier.

7) (…) JIT does not support management methods that allow for employee development.

8) (…) JIT is same as traditional process control approaches.

9) (…) JIT often require extensive employee training through interaction with supplier.

10) (…) several contemporary developments have challenged traditional methods of managing operations process.

11) (…) Only JIT inventory management has been shown to notably improve process efficiency.

12(…) The planning of JIT, TQC and EST takes much time and effort.

13(…) Contemporary process control have been developed by many international firms.

14(…) Contemporary techniques are highly consistent with the basic of new methods.

Answer the questions:

1) What is JIT?

2) Which function of JIT is important?

3) In which circumentances employers would prefer that an employee sit do nothing rather than produce an item that was not immediately required?

4) What are the requirements for applying JIT?

5) Demonstrate the characteristics and tools of JIT.

CHOOSE THE BEST ANSWER:

1) Contemporary developments have notably improved process because of ……

a) Faster though put b) scheduling
c) better resource d) a and c

2) Many of the contemporary ideas are popularly associated with …….

a) Japanese b) Americans
c)Europeans d) a , c

3) The Japanese tool operations management principle ……

a) Constantly b) seriously \
c) popularly d) similarity

4) Contemporary techniques are highly ……. with the basic of traditional methods .

a) management b) maintenance
c) consistent d) equipment

5) …. , …. , …. appears to challenge many traditional practice .

a) JIT b) EST
c) TQC d)All of them

6) Which is the effect of using JIT?

a) less space for inventory b) less work in process
c) less equipment movement d) all of the above

7) The Japanese tool operations management principle ……
Of traditional methods.

a) Constantly b) seriously c) popularly d) similarity

8) Contemporary techniques are highly ……. with the basic

a) Management b) maintenance c) consistent d) equipped

9) …. , …. , …. appears to challenge many traditional practice.

a) JIT b) EST c) TQC d) All of the above

FILL IN THE BLANKS WITH THE GIVEN WORD

Cost saving – Economic – Operation – Challenged - Maximum- Methods - logic

Several contemporary developments have ……. Traditional methods of managing operation process charts….models used to evaluate.
Many project that use contemporary techniques can result ….
Contemporary techniques challenge traditional practice of manufacturing such as ……. Equipment utilization, …….. order quantities and …… scheduling .

Read the passage then answer the best questions:

The most critical piece of ISO implementation puzzle is for the individual company to identify and document their processes as they actually occur, not the way they would like the process to happen. Past the specific ISO standard and contractual requirements, the primary focus of ISO 9000 is for a company to consistently do what they have documented and be able to show that the implemented quality system has established a continuous improvement discipline that is based on preventive measures.

1) According to the text, one requirement of ISO is the co…
   a) Should try to decide preventive measures
   b) Should document its real process events
   c) Need to make modification where required
   d) Needs to familiarize employees with the system

2) The primary focus of ISO is to……..
   a) improve quality b) increase production quantity
   c) change the layout d) document the process

PUT THE FOLLOWING WORDS IN ORDER:

1) originated-JIT-of-philosophy-in-Japan-the.

2) view-is now-termed-production-broad-the-lean-often.

Lesson 14:

Quality Control:

QC is a process to conform the product to a specified standard or machining tolerance. Organizations usually compete for customers on the basis of prices, availability and quality. Poor quality is unproductive and costly because of initial cost of producing defectives, the cost of inspecting, reworking or scarping product, and the potential cost of customer good will.

To determine where in the production chain, quality control must be employed is if the cost of inspection is less than the cost of scraps or rework.

The data for quality control analysis are either variable or attribute.

The variable data consist of all inspections that can be measured or is countable and then (X,R or X,S) charts are used, and attribute data is concerned with product acceptance or rejection(P chart). The C chart is used when the number of defects in one unit, and U chart is used for many numbers of defects in one unit is desired.

The statistical process control (SPC) embodies incoming materials, in manufacturing process, and outgoing goods.

The following chart depicts statististical quality control process.

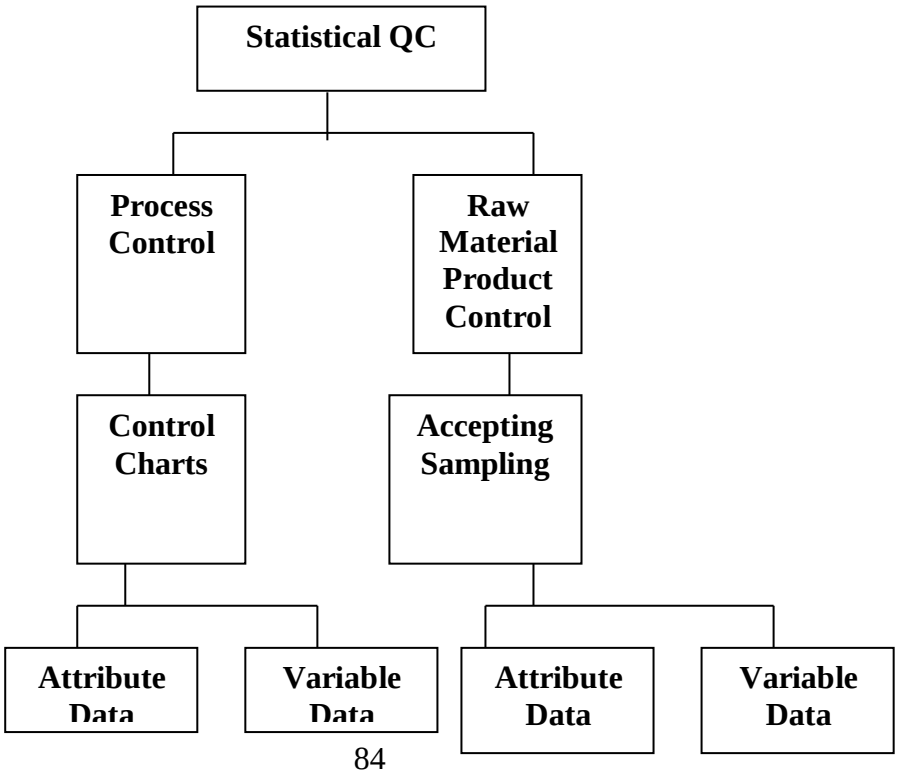


Figure a

Quality Control is done by sampling. Various methods of sampling depending on firm's policy are as follow:

1) one time sampling
2) double sampling
3) multiple sampling
4) Screening
5) MIL standards

The X, R and X, S are used for variable, and P, C, U charts are used for controlling attribute data.

The following are spc control charts that are used in quality control**.**

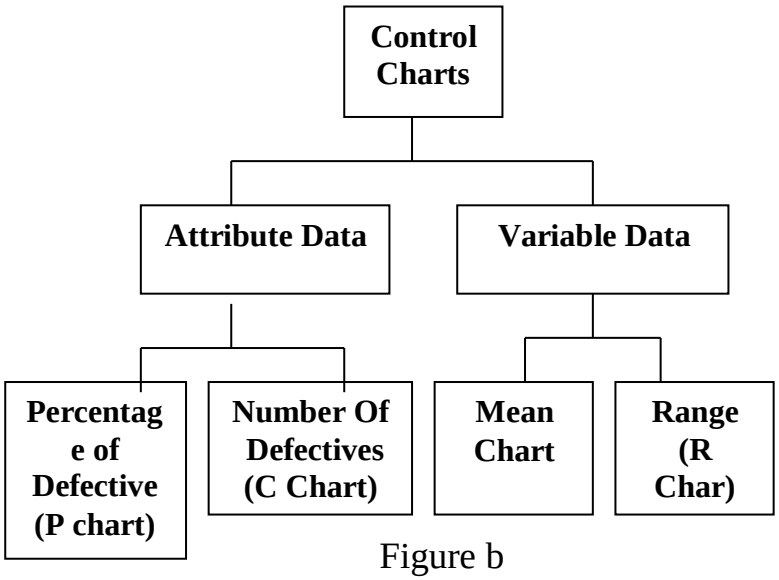


Figure b

Some QC terminologies are as follows:

Average Outgoing Quality Limit (AOQL) is the maximum possible vale of the average percent defective in the outgoing product.

Lowest Tolerance percent Defective (LTPD) is the lowest possible percent defective in the incoming lot.

Rejection plan:

Set of actions specified by a control plan, or other quality system documentation to be initiated when non conforming product or process instability is identified.

QFD (quality function deployment):

QFD is a structured method in which customer requirement are translated into approached technical requirement for each stage of development, design, and production of a product.

Function Verification:

Function verification is the process of testing to ensure the part conforms to all engineering performance and material requirements specified by the customer and supplier.

Check true or false:

1) (…) QC is a process to conform the product to specified standard.

2) (…) Poor quality is productive.

3) (…) The cost of inspecting and reworking or scraping, results in customer satisfaction.

4) (…) Quality control is done only by sampling.

Choose the best answer:

1) Variable data deals with a measurement of…….

a) How much b) how thick

c) How long d) all of the above

2) Attribute charts are obtained by……

a) Counting b) work station

c) Measurement d) inferior work

3) Quality is a measurement of how close a good or service conforms to……..

a) Raw materials b) specified standards

c) Inadequate machines d) defective tools

4) Acceptance sampling determines whether ……. or reject an entire lot of goods.

a) To compute b) to sub assemble

c) To accept c) to decentralize

5) Which one is not considered under quality control charts?

a) X, R, S charts b) R, P, OC charts

c) AQL, AOQL d) variable and attribute

Fill in the blanks with appropriate word:

accepted, impractical, fatigue, advantages, procedures

Much acceptance inspection is by sampling. Often 100% inspection turns out to be ……or clearly uneconomical. More ever, the quality of the product ……..may actually be better with statistical acceptance sampling ……than would be the case if the same product were subjected to 100% inspection. Sampling inspection has a number of psychological ……over 100% inspections. Inspector's ……..on repetitive operation may be a serious obstacle to good 100% inspection.

Read the following, and then choose the best answer:

Total Quality Control is the most important inspection control of all in cases where, despite statistical quality control techniques or quality improvements implemented, sales decrease, and your company will move to Mexico.

If the original specification does not reflect the correct quality requirements, quality cannot be inspected or manufactured into the product.

For instance, the parameters for a pressure vessel should include not only the material and dimensions, but also operating, environmental, safety, reliability and maintainability requirements.

Questions:

1- What is the purpose of quality control?

a- despite statistical quality control techniques
b- quality improvements implemented
c- sales decrease
d- All of the above

Read the following, and then choose the best answer:

The company-wide quality approach places an emphasis on three aspects:

1. Elements such as controls, job management, defined and well managed processes, performance and integrity criteria, and identification of records
2. Competence, such as knowledge, skills, experience, and qualifications
3. Soft elements, such as personnel integrity, confidence, organizational culture, motivation, team spirit, and quality relationships.

The quality of the outputs is at risk if any of these three aspects is deficient in any way.

Laboratory quality control is designed to detect, reduce, and correct deficiencies in a laboratory's internal analytical process prior to the release of patient results

and improve the quality of the results reported by the laboratory. Quality control is a measure of precision or how well the measurement system reproduces the same result over time and under varying operating conditions. Laboratory quality control material is usually run at the beginning of each shift; after an instrument is serviced; when reagent lots are changed; after calibration, and when patient results seem inappropriate. They should have the same matrix as patient specimens, including viscosity, turbidity, composition, and color; simple to use; minimal vial to vial variability, because variability could be misinterpreted as systematic error in the method or instrument; stable for long periods of time in large enough quantities to last at least one year and liquid controls are more convenient than lyophilized controls because they do not have to be reconstituted minimize pipe ting error.

The control charts: a statistical approach to the study of manufacturing process variation for the purpose of improving the economic effectiveness of the process. These methods are based on continuous monitoring of process variation. The control chart, also known as the 'Shewhart chart' or 'process-behavior chart' is a statistical tool intended to assess the nature of variation in a process and to facilitate forecasting and management. A control chart is a more specific kind of a run chart. The control chart is one of the seven basic tools of quality control which include the histogram, pare to chart, check sheet, control chart, cause and effect diagram, flowchart and scatter diagram. Control charts prevent unnecessary process adjustments; provides information about process capability; provides diagnostic information and it is a proven technique for improving productivity. QC is very important.

Questions:

1- The company-wide quality approach places an emphasis on how many aspects?

a- one b) two
c- three d) four

2- What is the control charts?

a- is a statistical approach to the study of manufacturing process variation
b- is a statistical tool intended to assess the nature of variation in a process
c- is to facilitate forecasting and management
d- none of the above

PUT THE FOLLOWING WORDS IN ORDER:

1) common-definition-the-quality-is-manufacturing-conformance-most.

2) manufacturing-produce-in contrast to-organizations-service-tangible-a product-that is.

Lesson 15

The definition of TQC:

The fourteen points of Deming emphasizes management's key role in defining and teaching the necessity of quality. Quality is viewed s the responsibility of each employee along the entire chain of production from input suppliers to distributors. Enhanced communication along this chain and use of statistical methods are required. Deming's fourteen points provide the foundation for the definition of TQC today. Put simply, the definition of TQC is a philosophy of zero defects, which assigns quality responsibility at the source of production by (1) training and using established statistical techniques to identify and anticipate quality failure and (2) by improving equipment reliability through monitoring and preventive maintenance.

TQC departs from traditional quality control methods in several ways. Statistical process control and preventive maintenance, comprehensive management information system, Quality assessment of every item, rather than inference based on a sample, and quality assurance at the source, rather than after production, differentiate TQC programs from traditional quality control.

The Characteristics and Tools TQC:

The Characteristics of TQC include: (1) census evaluation/zero defects, (2) quality at the source, (3) equipment reliability/reduced redundancy, (4) reduced scrap and waste (5) employee involvement.

Census Evaluation/Zero Defects: Every component and every process is evaluated for quality during the production process. A census (100 percent sampling) assures zero defects.

The costs of quality should be carefully studied, including both the costs of defects versus defect prevention. Budgeting for the cost of quality early in the process is important. The budget should not separate quality control from production. Rather, the mechanism of quality assurance and the costs should he

built into every job standard. Training in quality evaluation methods should be provided to every employee and should be budgeted as cost of quality.

CHECK TRUE OR FALSE:

1) (…) The 14 points of Deming emphasized top management's key role in defining and teaching the necessity of quality.

2) (…) Quality is viewed as the responsibility of each employee along the entire chain of production from input supplied to distributors.

3) (…) Deming's fourteen points provide the foundation for the definition of EFQM.

4) (…) The definition of TQC is a philosophy of zero defects.

5) (…) Statistical process control is the use of statistical techniques and tools to measure an ongoing process for change or stability.

6) (…) A census (100 percent sampling) inspection assures zero defects.

7) (…) The cost of quality is just cost of defects.

8) (…) Chart that examines root causes of problem is fishbone charts.

9) (…) Differentiating TQC program from traditional quality control consideration to quality assessment of every item.

10) (…) the budget of quality control shouldn't be separated from production.

CHOOSE THE BEST ANSWER:

1) The concept of TQC is develop by ……..

a) Joseph Juran b) Phillip Crosby

c) Walter Masing d) Deming

2) The application of statistical techniques to control a process is ……

a) SPC b) TQC

c) TQM d) MSA

3- The definition of TQC is a philosophy of …….

a) Quality management b) Quality assurance

c) Zero defect d) Quality control

4) TQC assigns quality responsibility at the resource of production by ……..

a) Training and using SPC b) Using reliability

c) Measurement system analysis d) Both A and B

5) Use of spc technique is to ……..

a) Identify quality failure b) Focus on quality assurance

c) Focus on production c) Non of the above

6) Which item is not a tool of TQC ……

a) Census evaluation b) Equipment reliability

c) Scarp and waste d) Quality function deployment

7) In TQC, quality is viewed as the responsibility of …….

a) Manager of quality b) Manger of production

c) Manager of inventory c) Every employee

8) The cost of TQC include ……

a) Cost of marking b) Cost of production

c) Cost of inspection d) Cost of defect prevention

9) Which tools of quality is used for TQC

a) Fish bone b) Pareto chart

c) Histogram d) all of the above

10) Statistical process control technique developed by ……

a) Walter Schewhart b) Elton mayo

c) H.G.Roming d) Both A and B

11) JIT implies a zero defects quality control effort that is ……..

a) TQC b) SPC

c) QFD d) None of them

12) TQC assigns quality responsibility at the source of production by …….

a) Using established statistical techniques to identify quality failure

b) Using histogram charts

c) By improving equipment reliability

d) Both a and c

Fill in the blanks place with the given words.

Reduces – component – departs – responsibility – failure – statistical methods – source – zero defects – equipment – census - foundation

Quality is viewed as the …… of each employee along the entire chain of production from input suppliers to distributors. Enhanced communication along this chain and use of …….. are required. Deming's fourteen points provide the …… for the definition of TQC today. The definition of TQC is a philosophy of ……. TQC …… from traditional quality control methods in several ways. Statistical process control and preventive maintenance anticipate production …….. the characteristics of TQC include : Zero defects, quality at the …….. , …….. Reliability and …….. Scarp or waste. In zero defects every …….. And every process is evaluated for quality during the production process. A …….. assures zero defects.

Read the following, and then choose the best answer:

Total Quality Control is the most important inspection control of all in cases where, despite statistical quality control techniques or quality improvements implemented, sales decrease, and your company will move to Mexico.

If the original specification does not reflect the correct quality requirements, quality cannot be inspected or manufactured into the product.

For instance, the parameters for a pressure vessel should include not only the material and dimensions, but also operating, environmental, safety, reliability and maintainability requirements.

Questions:

1- What is the purpose of quality control?

a- despite statistical quality control techniques
b- quality improvements implemented
c- sales decrease
d- All of the above

PUT THE FOLLOWING WORDS IN ORDER:

1) integral part-process-quality-is an-finance-of the.

2) stringent-quality evaluation-standards-the-should be- used-and.

Lesson 16:

Preventive maintenance:

Anyone who has experienced the inconvenience of breakdown in equipment can understand the frustration, delay, and expenses it can cause. These consequences can occur for almost every aspect of an operating system. Because facilities and equipment are continually wearing out, they need repairs and replacement. Maintenance is the foundation that keeps the production system operable. It is aimed at keeping or restoring any asset to its satisfactory operating status. Maintenance is primarily concerned with maintaining plants, machinery, equipments, inspecting periodically, overhaul and replacement policies. It usually involves such tasks as replacing worn-out parts, service equipment, lubrication, keep up buildings, making emergency repairs, and so forth. Without proper maintenance, costly production delays can be experienced, excessive idle time incurred, and unsafe working condition encountered. It is an important, if not vital, for any production system.

Types of maintenance:

1) Preventive maintenance:

PM is actions taken periodically to avoid equipment failure and to increase life time and reliability of the equipments, such as lubrication and part replacement.

2) Corrective maintenance is an activity to adjust, repair, replace parts and lubrication before a failure occurs.

3) Emergency maintenance is actions taken when equipment fails (malfunction) to operate. Consequently repair, part replacement, adjusting and possible complete overhaul or equipment replacement may be required.

4) Predictive maintenance:

Activities based on process data by using some sort of equipments, aimed at avoidance of maintenance problems by analyzing and prediction of likely hood failure modes to prevent breakdown.

.

Reliability:

Reliability (survival function) is the probability that a system will operate in a satisfactory mode for that period of time, when used under stated condition. Hazard rate is a point of time that the equipment no longer is operable.

Maintenance terminologies:

MTBF = mean time between failure

MTTR = mean time to repair

MTBM = mean time between maintenance

MTBP= mean time between preventive maintenance

MTTF= mean time till failure

Failure mode and effect analysis (FMEA): FMEA is a systematized group of activities intended to:

- Recording and evaluating the potential failure of product, process and its effects by the use of fish bone and Parato diagram.
- Identify actions which could eliminate or reduce the chance of the potential failure occurring
- Documentation of the process

Check true or false:

1) (…) Maintenance is the foundation that keeps the production system operable.

2) (…) Maintenance is the primarily concerned with plants, machinery, and equipments.

3) (…) Preventive maintenance is the prediction of failure mode.

4) (…) Reliability is the determination that a system will operate in a satisfactory mode forever.

Choose the best answer:

1) Preventive maintenance is the same as :

a) Periodic maintenance

b) Emergency maintenance

c) Occasional repair

d) Both b and c

2) Maintenance is concerned with:

a) Buildings b) vehicles

c) Equipments d) all of the above

3) Which maintenance policy has the highest cost?

a) Preventive maintenance b) corrective maintenance

c) Emergency maintenance d) predictive maintenance

4) The mean time between maintenance is:

a) MTBF b) MTBM c) MTTR d) MTBP

Fill in the banks with appropriate word:

a subsystem- probability- adequate- core

Many definitions of reliability exist, depending upon the viewpoint of the user. However, they all have a common …….which contains the statement that reliability is the ……..that a device performs adequately over interval [0, t]. In general, it is assumed that unless repair or replacement occurs, adequate

performance at time t implies ……performance during that interval. The device under consideration may be an entire system, ……., or a component.

Read the following, and then choose the best answer:

Total preventive maintenance (TPM) is a concept through which plants, machinery, and equipment operators are empowered to maintain continuous production on totally efficient lines. It is a tried and tested way of cutting waste, saving money, making factories better place to work. It gives operators the knowledge and confidence to manage their own machines, Instead of waiting for breakdown. Then calling the maintenance engineering, they deal directly with small problems before they become big ones. Operators investigate and then eliminate the roots cause of machine errors. Also, they work in small teams to achieve continuous improvements to the production line.

1) According to the passage; TPM:

a) Totally works on preventive maintenance activities.

b) Continuously operates the plants, machinery, and equipments.

c) Makes the production system more economical.

d) Is a tool for cutting the disposed material and waste into small pieces.

2) Through TPM concept:

a) Operators learn to find the main causes of machine failure.

b) Operators investigate about how they can eliminate their own operational errors.

c) The root cause of machine errors is due to the elimination of small problems and prevents them from becoming big one**.**

d) All of the above statement are correct.

3) According to passage, TPM:

a) Make the operators to work on big maintenance problems.

b) Makes the operators confident to call the Maintenance engineering for any small problem.

c) Makes the maintenance engineering confident to deal directly with small problems.

d) Makes the operators confident to deal with small problem and prevent them from becoming big ones**.**

PUT THE FOLLOWING WORDS IN ORDER:

1) aspect-quality management-maintenance-preventive-is-in-important-an-JIT.

2) how-you know-maintenance-preventive-important-is

Lesson 18:

Mathematical programming:

The techniques referred to as mathematical programming include methods to solve linear, nonlinear, integer, geometric, goal, stochastic, binary (0-1), and mixed integer problems as well as the transportation problem, the assignment problem, networks and others. Each of these techniques and their associated solution procedures involves a model of some process or situation and the determination of a best or optimal (maximum or minimum) solution in terms of profits, costs, or other measure of merit through the proper allocation of limited resources.

The fundamental concepts were developed in late1940s and 1950s, and have been elaborated upon ever since. Generally, many practical problems involve prodigious amounts of computation; hence, the rise in usefulness of mathematical programming has paralleled the growth in computers. Many texts are devoted exclusively to one or more of these techniques, and lengthy users' manuals exist for standard computer packages. Our purpose here is only to acquaint or refresh the reader with the basic models and solution techniques, particularly as they are found in applications related to production and operations management. Such applications include optimal blending of raw materials into final product, aggregate planning, optimal critical path method (CPM) schedules, capital budgeting, and other resource-constrained complex problems.

LINEAR PROGRAMMING AND THE SIMPLEX SOLUTION TECHNIQUE

At the heart of mathematical programming is linear programming model for the real world expressed in linear equations; that is, all variables are to the first power (e.g., X, Y, etc. not x^2, nor products like XY). Furthermore, none of the variables can take on negative values, and they must be continuously divisible that is, they can take on values such as 0.5 or 3.167 as well as 4. Finally, there is

no uncertainty in the coefficients or values in the model. The various other mathematical programming techniques either relax these conditions to obtain more realistic models-such as, nonlinear and stochastic programming-or impose additional conditions to handle real-world situations more accurately; such as integer and goal programming. The solution procedures are generally more complex as a result. While these conditions (linearity, non negativity, continuity, and certainty may seem restrictive in developing models, they have proved to be a hindrance: in many settings.

The general form of a linear programming problem is a set of linear relationships defining the tradeoffs for each resource that is to be allocated and a single objective function chart gives the contribution of each decision variable. Mathematically that might resemble the following:

Objective function: Maximize $Z = 1.8 X + 2 Y$

Subject to:

Constraints	$5X + 6Y < 27.75$
Or	$4X + 2Y < 13$
Requirements	$3.6 X + 8.1 Y > 2$

(Note: The non negativity constraint is usually not shown explicitly, nor is it required, since the solution procedure guarantees its existence.)

In a problem such as this (having only two variables), the system of equations can be easily graphed and the solution obtained by inspection. Few real-world problems are this simple, but the graph can illustrate the innate features of any mathematical programming problem.

CHECK TRUE OR FALSE

1) (…) Concept of linear programming was developed in the 1950s.

2) (…) Many practical problems involve few amounts of computation.

3) (…) Rise in usefulness of mathematical programming ahs paralleled the growth in computers.

4) (…) An application of linear programming is optimal blending of raw materials into a final product.

5) (…) An application of linear programming is aggregate planning.

6) (…) An application of linear programming is optimal critical path method.

7) (…) One application of linear programming is schedules, and other is capital budgeting.

8) (…) Variables in linear programming are to the first power.

9) (…) Variables in linear programming can take on negative values.

10) (…) Variables in linear programming must be continuously be divisible.

CHOOSE THE BEST ANSWER:

1) The heart of mathematical programming is….

a) simplex method b) linear programming

c) computer d) assignment

2) A linear programming problem always give……

a) a solution b) a good solution

c) optimal solution d) none of the above

3) In ……..programming the number of variable and its associated cost are dependent.

a) linear programming b) transportation model

c) non linear programming d) integer programming

4) In which model the non negativity can be relaxed.

a) linear programming b) integer programming

c) non linear programming d) all of the above

Fill in the blanks place with the given words.

Accurately – divisible – uncertainty – equations – power – coefficients handle – impose – relay - negative

At the heart of linear programming (LP) is a model of the real world expressed in linear nor …… that is, all variables are to the first (e.g. x , y , et , c …. $x^{۲}$ products like XY) furthermore, non of variables can take on ……. Value, and must be continues ……. that, they can take on value the model. (The various other mathematical programming techniques either ……. These conditions to obtain more realistic models-such as non linear and stochastic programming-or …….. Additional condition to ……. Real world situations more …….. , Such as integer and goal programming.

Read the following paragraph and choose the best answer:

Qualitative analysis (QA) is the scientific approach to managerial decision making. This approach starts with the data. Like raw materials for factory, these data are manipulated or processed into information that is useful and valuable to people making decisions. This process or manipulating of data into meaningful information is the heart of QA.

Questions:

1) According to the passage:

a) QA means a "decision making" by the use of meaningful information.

b) The heart of QA is "meaningful information".

c) QA approach concentrates on the changing the raw data in to meaningful information.

d) Qualitative factors are additional factors that are not needed for final decision making.

2) The passage implies that:

a) Meaningful decisions can be merely based on the results of QA.

b) In making managerial decision, qualitative and quantitative data should be combined together.

c) QA means the addition of qualitative factors to managerial considerations.

d) Qualitative factors are additional factors that are not needed for final decisions in the management.

3) According to the passage:

a) Valuable information for decision makers can be prepared through data analysis.

b) People making decision are always supplied with valuable information obtained through data manipulation or data processing.

c) People who make decisions are useful and valuable for processing the data.

d) None of the above statements are in accordance with the passage.

4) According to the passage:

a) Raw material in the factory provides data which can be processed and manipulated.

b) QA is the process for providing raw material in a factory.

c) Information about raw material in a factory is like data for QA system.

d) The processing of data into useful information is like processing of raw material into useful product in a factory.

PUT THE FOLLOWING WORDS IN ORDER:

1) uncountable- are those-decision-which-the-cannot-influence-maker-the.

2) development-once the-and data-steps-preparation-completed-have been-model.

3) optimal-two-program-alternate-solutions-or more-optima-when-there are-has.

Lesson 19:

COMPUTER SIMULATION:

Computer simulation is a procedure that attempts to recreate a problem situation under study by developing a computer model of the process. Then, through a series of experiments with this model, the technique attempts to better understand the behavior of the process, and evaluate the consequences of various changes in the process. Computer simulation ranks as one of the most often used quantitative solution techniques. The Urban study indicates that computer simulation was used in approximately 25% of the projects involving operations research methodology. Some of the reason why computer simulation is such a significant problem-solving tool is listed below.

1. Computer simulation can often be used to obtain good solutions to problems that are too complex and difficult to solve using other existing analytical solution procedures.
2. The approach is relatively easy to explain and understand the result, thus management confidence is increased.
3. Computer manufacturers have developed extensive software packages which consist of specialized computer simulation programming languages, thus facilitating use by analysts.
4. In practice, the technique has been applied successfully to wide range of decision-making problems.

Another advantage of the simulation approach is that the simulation model or simulator provides a convenient experimental laboratory.

In general, as the number of random variables in the problem becomes larger, the simulation will be the best or perhaps the only applicable technique.

Once the computer program has been developed, it is usually relatively easy to experiment with the model. For example, if we want to know the effect of an increase a machine or decrease a worker, the effect of experimental changes can be investigated.

Simulation is not without its disadvantages. One obvious disadvantage is that someone must develop the computer programs. For large simulation projects this is usually substantial undertaking. Hence one should certainly not attempt to develop a simulation model unless the potential gains promise to outweigh the costs of model development. This disadvantage has been reduced in recent years with the development of computer simulation packages. The use of these packages often leads to considerable savings in time and money as the computer program or simulator is developed.

Another disadvantage of simulation is that it may not lead to the optimal solution to the problem. One usually selects those values of the decision variables to test in the model that have a good chance of being near the optimal solution. However, since it is usually too costly to try all values of the decision variables, and since different simulation runs provide different results, there is no guarantee that the best simulation solution found is the overall optimal solution. Nonetheless, the danger of obtaining bad solutions is slight if good judgment is exercised thru statistical analysis such as sampling, independence testing, confidence interval, and hypothesis testing, various reduction techniques. The decision maker usually has a good idea of reasonable values to try for the decision variables, and it is usually possible to run the simulation long enough to identify apparent best decisions.

And finally the cost of providing computer software or package and hardware may be very high.

Gpss, Simscript, Taylor, Arena, Slam and Simfactory are some common computer programming languages or package used for simulation studies. These packages are continuous, discrete or general models, and process or timing table solution techniques.

The steps of a simulation study include:

1) Problem formulation
2) Model building

3) Independence testing and data acquisition
4) Computer modeling
5) Verification
6) Validation
7) Experimental design
8) Result analysis
9) Implementation and documentation

CHECK TRUE OR FALSE

1) (…) Computer simulation is a procedure that attempts to create a problem situation under study by developing a computer model of process.

2) (…) Computer simulation often used to obtain good solutions to problems that are too complex and difficult to solve.

3) The approach of computer simulation is relativity hard to explain and understand.

4) (…) Computer manufactures have developed extensive software packages which consist of specialized computer simulation programming languages.

5) (…) Simulation process such as a random number must be employed to generate values of the probabilistic components in the model.

6(…) Forecasting procedure must be developed to keep track of what is happening in the simulation process.

7(…) The simulation process must be conducted for many days or periods in order to establish the long-run evaluation of the decision alternatives or other changes in the system.

8(…) Simulation in many days or period guarantees an optimal solution.

9(…) Computer simulation is used in 40% of the projects involving O.R methodology.

CHOOSE THE BEST ANSWER:

1) Computer simulation is a procedure that attempts to …… a problem situation under study by developing a computer model of process.

a) Create b) recreate c) solve d) explain

2) Computer simulation was used in approximately …… of the projects involving operation research methodology.

a) 30% b) 10% c) 25% d) 45%

3)……. procedures are available for solving the problem.

a) Research b) Practice

c) Analytical d) Any

4) Which model must be developed to represent the various relationships existing in the problem situation?

a) Mathematical b) probabilistically

c) constant d) deterministic

5) Simulation process such as a random number procedure must be employed to generate values of the …….. components in the model.

a) Mathematic b) probabilistic c) deterministic d) variable

6) ……..... uses an empirical a random number procedure to create values for the probabilistic components of a simulation model.

a) Simulator b) Monte Carlo simulation

c) GPSS d) SIMSCRIPT

7) Which is <u>not</u> a computer programming language for simulation studies?

a) GPSS b) SIMSCRIPT c) CRAFT d) SLAM

Fill in the blanks place with the given words.

Approximately – Procedure – quantitative – recreate – experiments - consequences

Computer simulation is a …… that attempts to …….. a problem situation under study by developing a computer model of process. Then, through a series of ……. With this model, the technique attempts to better understand the behavior of the process modeled or evaluate the …… of various changes in the process. Computer simulation ranks as one of the most often used ……. solution techniques. The Turban study referred to in Chapter I indicated that computer simulation was used in …….. 25% of the projects involving operations research methodology.

Read the following, and then choose the best answer:

Traditionally, forming large models (spelt 'modeling' in American English) of systems has been via a mathematical model, which attempts to find analytical to problems and thereby enable the prediction of the behavior of the system from a set of parameters and initial conditions.

While computer simulations might use some algorithms from purely mathematical models, computers can combine simulations with reality or actual events, such as generating input responses, to simulate test subjects who are no longer present. Whereas the missing test subjects are being modeled/simulated, the system they use could be the actual equipment, revealing performance limits or defects in long-term use by these simulated users.

Note that the term computer simulation is broader than computer modeling, which implies that all aspects are being modeled in the computer representation. However, computer simulation also includes generating inputs from simulated users to run actual computer software or equipment, with only part of the system being modeled: an example would be flight simulators which can run machines as well as actual flight software.

Computer simulations are used in many fields including science, technology, business planning and scheduling.

Questions:

1- What is the purpose of mathematical model?

a- attempts to find analytical solution to problems

b- enables the prediction of the system behavior

c- finds the best answer

d- a & b

PUT THE FOLLOWING WORDS IN ORDER:

1) generate- values-simulator-the-must-number-random-of.

2) has been- developed- once-the–computer- program.

Lesson 20:

Waiting line models:

Everyone has experienced waiting line situations such as a line of customers at a supermarket checkout counter, a line of customers at a teller window of a bank, or a line of cars at a traffic light. In these and many other situations, waiting time is an undesirable occurrence for all parties concerned. For example, the customer in the supermarket checkout line can become very annoyed with excessive waiting times. In addition, the excessive waiting times, while indicative of many customers, are equally undesirable for the manager of the supermarket. The manager realizes that long waiting lines mean that customers are not being promptly serviced. Eventually, these long waiting times may cause potential repeat customers to seek better service elsewhere, thus proving costly in terms of lost future sales.

If the manager in our supermarket example is concerned about the existence of long waiting lines, one obvious answer would be to add more checkout counters. This added service capability should provide better service and correspondingly shorter customer waiting lines. However, adding additional supermarket checkout counters will lead to greater costs in terms of additional personnel, equipment, and space requirements. Thus waiting lines problem will require the manager to balance the benefits of better service with the added costs involved.

Quantitative models have been developed to help manager understand and make better decisions concerning the operation of waiting lines. In operations research terminology, queuing theory involves the study of waiting lines, where the waiting line is referred to as the queue. Thus in our supermarket example, the customers in the waiting line have been referred to as the customers in the queue and budgets are referred to as servers.

For a given waiting line problem, queuing models may be used to identify the system's operating characteristics such as:

1. The percent of time or probability that the service facilities (checkout counters) are idle (Po).
2. The probability of a specific number of units (customers) in the system (pn).
3. The average number of units in the system (L).
4. The average time each unit spends in the system (waiting time plus service time) (W).
5. The average number of units in the waiting line or queue (Lq).
6. The average time each unit spends in the waiting line (Wq).
7. The percent of time or probability that an arriving unit will have to wait.

With the above information together with service cost estimates, customer waiting line limitations, and customer waiting time costs, the decision maker will be better equipped to make decisions that balance desirable service levels with service costs.

Any queue line discipline includes:

1) Number of servers, and queues in the system
2) The manner of which customers enter the system(units, or batch)
3) The manner customers are serviced which is FIFO, LIFO, random or priority
4) The entering and service probability distribution

Analytical and simulation models of waiting lines can assist in developing good decisions for waiting line problems.

Check true or false:

1) (…) Quantitative models are the only solution way of queuing system.

2) (…) Waiting time is a desirable occurrence for customers.

3) (…) Customer entrance in an elevator is FIFO.

Choose the best answer:

1) Which one is not considered an operating characteristic for queuing theory.

a) The average number of units in the system.

b) The average time each unit spends in the queue.

c) The percentage of time that arriving unit must wait.

d) The number of servers in the system.

2) Which is the main aim of a queuing study?

a) Gives good service

b) Balance the total service cost with waiting cost

c) Lower customer time

d) Lower service personnel

Fill in the blacks with appropriate word:

Service- selected – leaves- enter- assumed

The basic process…… by most queuing models is the following. "Customer" requiring service are generated over time by an "input Source". These customers …….the queuing system and join a queue. At certain times a number of the queue is ……for service by some rule known as the queue discipline or…… discipline. The required service is then performed for the customer by the service mechanism, after which the customer ……the queuing system.

CHOOSE THE BEST ANSWER:

Waiting line models are valuable in that they describe or predict how the waiting line will function under a variety of operating alternatives. They are extremely helpful in identifying potential waiting times, queue size idle times,

and so on. However these models do not directly recommend or identify minimum cost and optimal decisions.

The solution of waiting line may require the decision maker to trade- off the cost reduction resulting from better service with the increased cost of achieving the better service.

1) The main aim of this passage is…….

a) a queue study is helpful

b) minimum total cost is the main object

c) relation between queue line and management

d) achieving better service

2) Trade- off in line 6 means:

a) to give b) to decide

c) to balance d) to maintain

PUT THE FOLLOWING WORDS IN ORDER:

1) priority-achieve-results-different-rules-different.

2) service-the-number- facility-are-servers.

Lesson 21:

MANAGEMENT INFORMATION SYSTEMS:

In order to be effective in any organization, managers need accurate and timely information, as a basis for decision making. Just as production manager needs the latest and best possible product forecast information in order to prepare his production schedule, a stockbroker needs good up-to-date information on stock market behavior in order to make effective portfolio management decisions. We will refer to the specific information the manager uses in the decision-making process as management information. Since the desired management information often comes from a variety of sources and since the total information needs of the manager may be large, many organizations have designed and implemented

formal systems for collecting, analyzing, and reporting information to the managers. Such systems are referred to as management information systems.

A complete introduction to management information systems would range from a broad, philosophical discussion of the management function to the information system details of data file organization, data base management, and data retrieval codes.

Simply stated, a management information system is any procedure or system designed to collect, organize, and process data to provide the information management needs to make an accurate decisions.

The essential role of a management information system is to transform data describing the operation of the business into information that is useful for decision making.

It is essential that the data be captured and transformed into the desired management information so that the information will be readily available to the decision maker when it is needed. Although there have been and still do exist information systems that operate without the use of computer, the time demands for information coupled with the sheer volume of data and information need, have tended to make the computer an essential part of most information systems.

Virtually all organizations have some form of a management information system. According to Terrance Harnold, President of the Pillsbury Company, "Theoreticians may debate the topic endlessly, but a management information system has become an absolute necessity for successful operation of a large and complex business enterprise." The more successful organizations more often have excellent system, while those organizations that have not can often attribute at least portion of their lack of success to improper planning and use of their management information system.

The starting point for any management information system is an organized collection of data that is generally referred to as the data base. Because of the

large volume of data available in many organizations, the data base is frequently stored in a computerized system.

The overall management information system process of transforming data into information is shown in Figure 19.1.

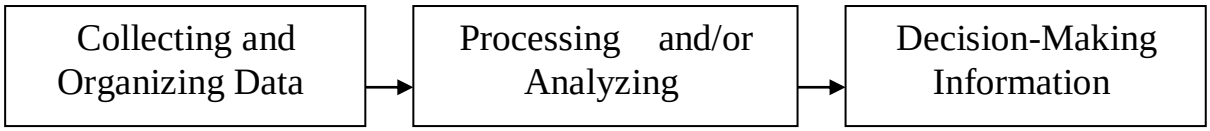


Figure 19.1 The management information system process

Check True or False:

1) (…) The starting point of MIS is organized collection of data.

2) (…) The essential role of MIS is to transform data into Information.

3) (…) A computer program is always necessary for MIS application

Choose the best answer:

1) Information roles of managers include all of the following except……

a) disseminator b) figurehead

c) monitor d) spokesman

2) In decision-making, condition under which the manager can

estimate the probability of outcomes is called condition of….

a**)** certainty b**)** danger

c**)** risk d**)** uncertainty

3) Information regarding the actual performance or the results

Of the activities of a system is called:

a) Equality b) Data system

c**)** Feedback d) Information

4) The primary goal of MIS is to**:**

a) Define organizational objectives.

b) Eliminate internal constraints.

c) Make a manager's job easier.

d) Make manager more effective decision maker**.**

Fill in the blanks with appropriate word:

happened- systems- transforms -consists of- access

The report-generator MIS is the simplest type of management information system in that it simply ……the raw data contained in the data base into summary report. Essentially the reports (information) produced by these …….attempt to capture and convey the results of business activities that ……..in the past or currently exist. In these form the report-generator MIS …….several computer programs each of which has been specially designed to ……..the data base and create a specific report.

Read the following, and then choose the best answer:

An 'MIS' is a planned system of the collecting, processing, storing and disseminating data in the form of information needed to carry out the functions of management. In a way it is a documented report of the activities those were planned and executed. According to Philip Kotler "A marketing information system consists of people, equipment, and procedures to gather, sort, analyze, evaluate, and distribute needed, timely, and accurate information to marketing decision makers."

The terms MIS and information system are often confused. Information systems include systems that are not intended for decision making. The area of study called MIS is sometimes referred to, in a restrictive sense, as information

technology management. That area of study should not be confused with computer science. IT service management is a practitioner-focused discipline. MIS has also some differences with Enterprise Resource Planning (ERP) as ERP incorporates elements that are not necessarily focused on decision support.

Professor Allen S. Lee states that "...research in the information systems field examines more than the technological system, or just the social system, or even the two side by side; in addition, it investigates the phenomena that emerge when the two interact."

1- MIS refers to?
   a- should be confused with computer science
   b- in a restrictive sense, as information technology management
   c- in a restrictive sense, as IT service management
   d- all of the above
2) phenomena in last line means:
   a) object
   b) entity
   c) goods
   d) none of the above

PUT THE FOLLOWING WORDS IN ORDER:

1) all -organizations -information -virtually-system-form of -have -some a -management.

2) effective-in order to -timely -accurate –be- managers- need- and- information.

Lesson 21:

Six Sigma:

Six sigma claims that focusing on reduction of variation of each work element will solve process and business problems. By using a set of statistical tools to understand the fluctuation of a process, management can predict the expected outcome of that process. If the outcome is not satisfactory, associated tools can be used to understand the elements influencing that process through a rigid and structured investigation methodology.

Six sigma includes five steps: define, measure, analyze, improve and control (commonly known as DMAIC):

* **Define:** Practitioners begin by defining the process. They ask who the customers are and what their problems are. They identify the key characteristics important to the customer along with the processes that support those key characteristics, and then identify existing output conditions along the process elements.

* **Measure:** Next focus is on measuring the process. Key characteristics are to be categorized, then measures of systems are verified and data are collected.

* **Analyze:** Once data are collected, and analyzed, the intent is to convert the raw data into information that providing insights into the process. These include identifying the fundamental and most important causes of the defects or problems.

* **Improve:** The fourth step is to improve the process. Solutions to the problem are developed, and changes are made to the process. In this step, the company can evaluate whether the changes are beneficial, or if other set of changes is necessary.

* **Control:** If the process is performing at a desired and predictable level, it is put under control. The process is continuously monitored to assure no unexpected changes occur.

Focusing on the primary area of variation reduction also will result in secondary effect; quality improvement. Process investigation produces the re-evaluation of the value added status of any element. Some elements are modified, while others are discontinued, therefore elements are refined and improved, and opportunities for mistakes are reduced.

Some elements discovered in Six Sigma investigation limit the flow of products or services through the system. Flow is defined as the time between the inputs of raw material to the output of a saleable item. Improvement of a process that was restricting flow results in reduced variation, better quality and improvement in the volume of the process output. Thus the organization has less money tied up in in-process inventory. The time between paying for input material to obtain a profit is reduced, and the organization can respond to customer needs more quickly.

Six Sigma is found on two main assumptions. First, people in an organization understand, appreciate and employ every fact that represents features and characteristics of a process. They appreciate deeper understanding of data analysis can be used for improvements, and graphical representations of data can provide new and different perspectives of the process.

Another assumption is that through the reduction of variation of all the processes, the overall performance of the organization will be improved. But while it is hard to argue against improvement, the economic reality of business is intended the most improvement for the least investment. Improving all of an organization's individual processes could actually have a detrimental effect on the company's ability to satisfy the customer's needs and provide product and services at the right time with the lowest cost. The realized saving to the system might be less than the cost of all the improvements.

CHECK TRUE OR FALSE:

1) (…) Six Sigma claims that focusing on reduction of variation will solve process problems.

2) (…) The first step in 6 Sigma is measure.

3) (…) Six sigma includes five steps: "define measure, analyze, improve and control".

4) (…) The reduction of variation of all the processes, the overall performance of an organization will be improved.

5) (…) The economic reality of business is the most improvement for the more investment.

6) (…)The last step in six sigma is "analyze".

7) (…) Numbers can represent features and characteristics of a process.

8) (…) In the step 4 (analyze) of six sigma, key characteristics are categorized, measurement systems are verified and data are collected.

9) (…) If the process of performing at desired and predictable level is considered to be under control.

CHOOSE THE BEST ANSWER:

1. SIX Sigma claims that focusing on …….. of variation will solve process and business problems.

a) increase b) reduction c) study d) find

2. The assumption is the outcome of the entire process will ….. by reducing the variation of multiple elements.

a) exterminate b) reduction c) increased d) improved

3. The last step in six sigma is …….

a) define b) control c) measure d) improved

4. The reduction of …… of all the processes, the overall performance of the organization will be improved.

a) cost b) improve c) variation d) control

5. The first step in six sigma is ……..

a) define b) control c) measure d) improve

6. Six Sigma claims that focusing on ……

a) Reduction of variation will solve process and business problems

b) If the process is performing at a desired and predictable level, it is put under control.

c) Process investigation produces the re-evaluation of the value added status of many elements.

d) We want the most improvement for the least investment.

Read the following, and then choose the best answer:

Six Sigma is a business management strategy originally developed by Motorola, USA in 1981. As of end of 2010, it enjoys widespread application in many sectors of industry, although its application is not without controversy.

Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects (errors) and minimizing variability in manufacturing and business processes. It uses a set of quality methods, including statistical methods, and creates a special infrastructure of people within the organization ("Black Belts", "Green Belts", etc.) who are experts in these methods. Each Six Sigma project carried out within an organization follows a defined sequence of steps and has quantified targets. These targets can be financial (cost reduction or profit increase) or whatever is critical to the customer of that process (cycle time, safety, delivery, etc.).

Questions:

1- In which year Six Sigma enjoys widespread application?

a-1981

b- the first half of the year of 2010

c- the second half of the year of 2010

d- the first half of the year of 2011

2- How six sigma improves the quality of process?

a- identifying the causes of defects

b- Removing the causes of defects

c- Minimizing variability in manufacturing and business processes

d- all of the above

PUT THE FOLLOWING WORDS IN ORDER:

1) while- improvement- it is hard- but to –argue- against.

2)respond to- organization- quickly- can –customer- needs -more.

LESSON 22

Industrial engineering and computers

Industrial engineers use computer in performing their activities to increase management's confidence in their decisions. Computer programs have been developed in almost every area of the industrial engineering profession, from job standards to mathematical optimization.

Industrial engineering has clearly demonstrated its contribution to organizational effectiveness by applying the scientific analytical approach in interchanging the physical, human, and information activities. This new boundaries of expansion of the field, requires broad perspective of management-oriented I.E.s, rather than highly specialized staff members. Accepting this larger, more encompassing responsibility, I.E. must utilize all the tools in their command in order to provide managers with timely, accurate, and meaningful data on which to base their decision. The most obvious tool is the computer, with its capability of manipulating vast quantities of data and retrieving information, which used to take many hours of laborious effort. The effective use of this tool is one of the challenges to the I.E.

The effective use of computer and unlimited number of time saving and cost reduction applications are limited only by the aggressiveness and initiative of the professional I.E.

The benefits to be obtained from computer applications do not rest in the simple conversation of a manual system to an automated system. Conventional I.E application must be redesigned to take maximum advantage of the computer's unique capability. If I.E. can maintain their balance between overselling the computer and under utilizing the computer's capability, they will revolutionize their profession.

Industrial engineering with the initiative and desire to utilize this new tool are frustrated only by the expense for a yet- to- be-proven application in their field, where can these aggressive individuals turn for information with which to justify the use of this tool? It is recommended that I.E. initiate a program that would support an organization charged with the responsibility of developing and promoting the use of computer applications in I.E. tasks. With contributions from educational agencies and the users, this organization would soon perform the most valuable function of providing all industrial engineers with a focal point to obtain actual computer applications or information on where computer software or package might be obtained. Basically every I.E should know the following soft wares:

1) Computer Aided Design(CAD/CAM) for engineering drawing.
2) MATLAB for statistical and quality control analysis.
3) A project planning software such as MSP.
4) EXCELL for spread sheet problems such as files manipulation.
5) ACCESS for scientific calculations.
6) Specially software designed for I.E such as Winqsb.

7) Software in layout planning, and simulation studies.

WRITE TRUE (T) OR FALSE (F):

1) (…) An I.E should provide all necessary soft wares.
2) (…) The use of computer is necessary because the problems are very simple to solve.
3) (…) An I.E with initiative and desire should use computers.

Choose the best answer:

1) The computer programs have been developed in almost every area of…….
a .industrial engineering profession
b .technology
c. job standards
d .I.E

2) I.E must utilize all the tools their command in order ……
a. to apply the scientific analytical approach.
b .to specialize staff members **.**
c. to provide managers with timely ,accurate and meaning full data.
d. to retrieve information .

3) The effective use of computer is one of the ……. to the I.E.
a. difficulties
b. challenges
c. problems
d. facilities

4) An industrial engineering has clearly demonstrated its contribution to organizational effectiveness
By applying……in interchanging the physical ,human and…….
a .mathematical optimization---computer
b .the computer programs---I.E
c. the conventional I.E---educational activities
d. the scientific analytical approach ---information activities

5) Conventional I.E application must be redesigned to take maximum advantage of……
a. computers unique capacity
b .computer programs
c .information activities
d .educational agencies

6) IF I.E can maintain their ……..between overselling the computer and underutilizing the computers capacity, they will ……..their profession
a .interaction---compassing
b. balance---revolutionize
c. cost reduction application---promoting

d. valuable function---developing

7) I.E initiates a program that would support a single organization charged with……..of developing and promoting the use or……..in I.E tasks.

a. challenges---cost reduction applications.

b. information activities---educational efforts

c .responsibility --- computer application

d. meaning full data---computers capability

Fill in the blacks with appropriate word:

output - program - Initial- allocated- method

Design methodology is constructive…… of program design. The ……..step in applying it is to describe precisely the structure of the input and ……data. A static model of the data files is constructed through graphic notation. The data structure diagrams are combined to form the ……..structure, and the various executable operations that must be listed and …….within the resulting structure.

CHOOSE THE BEST ANSWER:

CAD is a system that uses computer graphics to design new products. Gone are days of drafting designs by hand. Today's powerful desktop computers combined with graphic software allow the designer to create drawing from any angle, rotate the object, split it to view inside, an magnify certain sections for closer view. CAD also can be performed to calculate the reactions of the design to stress and to evaluate strength of materials.

Computer Integrated manufacturing (CIM) is a term used to describe the integration of product design, process planning, and manufacturing using an integrated computer system. A simple system might CAD with some numerical controlled machines (NC). A complex system, might integrate purchasing, scheduling, inventory control, and distribution, in addition to other areas of product design. The key element of CIM is the integration of different parts of the operation process to achieve greater responsiveness and flexibility. The purpose of CIM is to improve how quickly the company can respond to customer needs in terms of product design and availability, as well as quality and productivity, and to improve overall efficiency.

1) CAD software performs:

a) rotate the view b) split inside view

c) magnifying c) all of the above

2) The purpose of CIM is……

a) product design b) availability

c) quality d) all of the above

3) The main difference between CAD and CIM is….

a) CAD is designing and CIM is for producing
b) Each software uses different hardware
c) CIM is more expensive than CAD
d) CAD responses to flexibility

PUT THE FOLLOWING WORDS IN ORDER:

1) cad- dramatically-speed-flexiblity-and-can-increase-theprocess-design-the.

2)1970-computers-widespread-became-business-in-use of-in the-the.

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