

INTERMEDIATE EXAMINATION

(REVISED SYLLABUS - 2008)

GROUP - II

Paper-9 : OPERATION MANAGEMENT AND INFORMATION SYSTEMS

Q. 1. Indicate whether the following statements are True/False

- (i) Conveyors create a relatively fixed route**
- (ii) Forging is the process of pouring molten metal into prepared Cavity.**
- (iii) Industrial trucks are used to pick up and move materials in different routes.**
- (iv) Annealing involves heating and cooling operations.**
- (v) Lathe is a special purpose machine.**
- (vi) Plant layout is a dynamic affair**
- (vii) Waste Management is necessary to survive in face of competition prevailing in current global market.**
- (viii) Work Study is a generic term for those techniques, particularly Method study and Work measurement**
- (ix) AFTWAYS is a system of Value Analysis.**
- (x) Flow control is applied in chemical industries.**
- (xi) Job evaluation determines relative worth of different jobs.**
- (xii) Gantt's Plan does not consider the element of security for workers.**
- (xiii) Labour card is prepared by dispatching department to book the labour involved in each operation**
- (xiv) The Scanlon plan is a wage incentive scheme**
- (xv) Z Chart is used in Quality Control.**
- (xvi) Maintenance management should reduce overall cost of maintenance.**
- (xvii) Breakdown maintenance helps in lowering the cost of breakdown.**
- (xviii) Linear Programming can solve problems involving variables not capable of being expressed in quantitative terms**
- (xix) Total output of all sectors is equal to total input of all sectors.**
- (xx) A slack variable represents unused capacity.**

Answer 1.

- (i) False.**
- (ii) False.**
- (iii) True.**
- (iv) True.**
- (v) False.**
- (vi) True.**
- (vii) True.**
- (viii) True.**

- (ix) False.
- (x) True.
- (xi) True.
- (xii) False.
- (xiii) False.
- (xiv) True.
- (xv) False.
- (xvi) True.
- (xvii) False.
- (xviii) False.
- (xix) True.
- (xx) True.

Q2. Fill in the blanks with more suitable pair given below :

- (i) Turning is a _____ process. (finishing/machining)
- (ii) Centrifugal pumps convert _____ energy into hydraulic energy. (mechanical/electrical).
- (iii) In process layout machines in each department attend to any _____ that is taken to them. (product/process)
- (iv) _____ is used in feeding coal continuously into furnace in an electric power station. (Gravity Chute/Belt Conveyor)
- (v) Shift working is suitable in case of _____ intensive technology. (capital/labour)
- (vi) Rucker plan is a _____ incentive plan. (group/individual)
- (vii) Ranking is a _____ method. (Value Analysis/Job Evaluation)
- (viii) Production management is a _____ function. (staff/line)
- (ix) Acceptance number is the maximum number of _____ items in a sample. (good/defective)
- (x) X chart is _____ chart. (mean/range)
- (xi) Labour Rate Variance is Actual Rate minus Standard Rate multiplied by _____ hours. (Actual/Standard)
- (xii) Repair maintenance is _____ maintenance. (preventive/breakdown)
- (xiii) Under input-output analysis only _____ input is treated as scarce. (labour/capital)
- (xiv) Optimum Capacity is rate of output at which there is _____ to change the size of the plant. (incentive/ no incentive)
- (xv) PERT is used in _____ jobs. (repetitive/non-repetitive)

Answer 2.

- (i) Machining.
- (ii) Mechanical.
- (iii) Product.
- (iv) Belt Conveyor.
- (v) Capital.
- (vi) Group.
- (vii) Job evaluation.
- (viii) Line.
- (ix) Defective.
- (x) Mean.
- (xi) Actual.
- (xii) Breakdown.
- (xiii) Labour.
- (xiv) No incentive.
- (xv) Non-repetitive.

Q3. (a) Match the terms shown in Table A with relevant terms in Table B :

Table A	Table B
a) ALDEP	i) Transportation application
b) MRP	ii) Quality control
c) CPM	iii) Demand for a product or service has to be justified each time budget is prepared.
d) VAM	iv) Inventory management.
e) AOQ	v) Cost control
f) EDD	vi) Plant layout
g) ZBB	vii) Work measurement technique
h) VA	viii) Project planning
i) BMT	ix) Japanese technology
j) BPR	x) Job sequencing
k) USP	xi) Standardisation
l) ISO	xii) Machine tool
m) CNC	xiii) Project funding
n) IFCI	xiv) Marketing strategy
o) JIT	xv) Its essence lies in two questions-Why and What if cutting across all functions.

Answer 3. (a)

Table A	Table B
a) ALDEP	vi) Plant layout
b) MRP	iv) Inventory management
c) CPM	viii) Project planning
d) VAM	i) Transportation application
e) AOQ	ii) Quality control
f) EDD	x) Job sequencing
g) ZBB	iii) Demand for a product or service has to be justified each time budget is prepared.
h) VA	v) Cost control
i) BMT	vii) Work measurement technique
j) BPR	xv) Its essence lies in two questions-Why and What if cutting across all functions.
k) USP	xiv) Marketing strategy
l) ISO	xi) Standardisation
m) CNC	xii) Machine tool
n) IFCI	xiii) Project funding
o) JIT	ix) Japanese technology

Q3. (b) State suitable Material Handling Equipments used in following operations:

- (i) Transferring heavy materials from one department to another
- (ii) Feeding coal and iron in steel plant.
- (iii) Transporting fertilizer packed bags to a truck on the ground below.
- (iv) Moving heavy load above the machine on the shopfloor.
- (v) Move palletised unit loads.

Answer 3. (b)

- (i) Roller Table.
- (ii) Belt Conveyor.
- (iii) Gravity chute.
- (iv) EOT Crane.
- (v) Fork-lift truck.

Q3. (c) State the machine tool to be used for following operations:

- (i) Melting steel for making castings.
- (ii) Picking up bits of iron and steel in a scrap yard.
- (iii) Squeezing a piece of hot metal in a die.
- (iv) Making a small hole in a block of metal.
- (v) Making keyways on inside surface of the bore of a pulley.

Answer 3. (c)

- (i) Electric Arc Furnace.
- (ii) Electromagnet
- (iii) Forging machine
- (iv) Drilling machine
- (v) Slotting machine

Q3. d) State the name of the following processes:

- (i) Heating metal into red and hammering into shape.
- (ii) Heating and cooling operations.
- (iii) Pouring molten metal into prepared cavity.
- (iv) Fusing metals together while in molten state.
- (v) Surface smoothing process with hand or machine
- (vi) Cutting and removing material from surface of the workpiece.

Answer 3. (d)

- (i) Forging
- (ii) Annealing
- (iii) Casting
- (iv) Welding
- (v) Lapping
- (vi) Turning

Q3. (e) What do following abbreviations stand for:

- (i) MTM
- (ii) MBO
- (iii) RA
- (iv) PERT
- (v) FMS
- (vi) AGVs
- (vii) JIT
- (viii) VAT
- (ix) CRAFT
- (x) BPE

Answer 3. (e)

- (i) Method Time Measurement.
- (ii) Management by Objectives.
- (iii) Relaxation Allowance.
- (iv) Programme Evaluation and Review Technique.
- (v) Flexible Manufacturing System.
- (vi) Automated Guided Vehicles.
- (vii) Just In Time.
- (viii) Value Added Tax.
- (ix) Computarised Relative Allocation of Facilities Techniques.
- (x) Business Process Engineering.

Q4. Choose the most appropriate alternative: (correct alternative is in bold)

- (i) Job evaluation determines
 - (a) relative worth of job holders
 - (b) relative worth of various jobs
 - (c) time taken for a job
 - (d) bonus
- (ii) Specifying the order in which individual jobs are to be executed
 - (a) Planning
 - (b) Loading
 - (c) Sequencing
 - (d) Routing
- (iii) Enamelling is a
 - (a) Heat Treatment Process
 - (b) Surface Treatment Process
 - (c) Machining Process
 - (d) Extrusion Process
- (iv) Capacity is
 - (a) Long term concept
 - (b) Maximum available output
 - (c) Not related to cost of production
 - (d) All of the above

- (v) Machines are arranged in sequence of operations:
 - (a) Product layout
 - (b) Process layout
 - (c) Fixed position layout
 - (d) Group layout
- (vi) Control chart for proportion of defectives is
 - (a) c-chart
 - (b) N-chart
 - (c) X chart
 - (d) p chart
- (vii) Normal time means
 - (a) time required by a qualified worker to do a job under normal circumstances
 - (b) how much time should be taken to get incentive
 - (c) time to do a job
 - (d) time required by any person to do a job
- (viii) Addition of value to raw materials through application of technology is
 - (a) Product
 - (b) Production
 - (c) Advancement
 - (d) Transformation
- (ix) Time Study aims
 - (a) to check what the worker is doing during the work
 - (b) to find the time taken by a worker to do the job
 - (c) to find out the time required to do a job
 - (d) to determine how to do a job
- (x) Ergonomics is
 - (a) fitting the job to worker
 - (b) fitting worker to job
 - (c) study of work content of job
 - (d) study of time required for a job
- (xi) Productivity of a person depends on:
 - (a) Motivation
 - (b) Ability
 - (c) Technology
 - (d) All of the above
- (xii) MRP stands for
 - (a) Material Requirement Planning
 - (b) Material Reordering Planning
 - (c) Material Requisition Planning
 - (d) Material Recording Planning
- (xiii) The incentive plan takes into account ratio of labour costs to production value:
 - (a) Rowan plan
 - (b) Gantt plan
 - (c) Halsey plan
 - (d) Scanlon plan

(xiv) Z chart is used for:

- (a) Cost control
- (b) Quality control
- (c) Programme control
- (d) Job control

(xv) FMS is

- (a) Future Manufacturing System
- (b) Flexible Manufacturing System
- (c) Forward Manufacturing System
- (d) Favourable Manufacturing System

Answer 4.

- (i) b.
- (ii) c.
- (iii) b.
- (iv) b.
- (v) a.
- (vi) d.
- (vii) a.
- (viii) b.
- (ix) c.
- (x) a.
- (xi) d.
- (xii) a.
- (xiii) d.
- (xiv) c.
- (xv) b.

Q5. (a) Name five general purpose machines.

- (b) A shaft 1600 mm in length is being machined on a lathe. If spindle executes 800 r.p.m and feed is 0.20 mm per revolution, how long will it take the cutter to pass down the entire length of shaft?
- (c) Distinguish between casting and forging.
- (d) Uses of Jigs and Fixtures.

Answer 5.

a) Five general purpose machines are as follows:

- (i) Lathe
- (ii) Drilling machine
- (iii) Grinding machine
- (iv) Milling machine
- (v) Planing machine

b) Feed = 0.20 mm

No. of revolutions in passing 1600mm = $1600/0.2 = 8000$

Spindle executes 800 r.p.m

Time required = $8000/800 \text{ mm} = 10\text{min}$

c) Difference between Casting and Forging.

Casting	Forging
Casting is a process of pouring a molten metal into prepared cavity or mould and allowing it to solidify. Examples , sand casting, centrifugal casting.	Forging is a process of heating the metal into red and then hammering it into shape. Examples ,drop forging, press forging etc.

- d) Jig is a device designed for holding the job and grinding the path of tool for a particular operation on a number of similar operations. A fixture is used to hold and support the work piece in a predetermined position for a particular machining operation.

Uses of jigs and fixtures are as follows:

- 1) Jigs quickly and accurately guide the tools .Difficult operations are rendered easier, speedier, and yet more accurate by using jigs.
- 2) Jigs help in mass production by producing accurately machined interchangeable parts.
- 3) Fixtures are essential in all machine work, because work must be firmly held at the time of working of tools.
- 4) Fixtures used along with jigs increase the speed and accuracy of work.

Q6. (a) Discuss the points to be considered while designing a Maintenance programme for an organization?

(b) Product A has a Mean Time Between Failures(MTBF) of 30 hours and has a Mean Time To Repairs (MTTR) of 5 hours. Product B has an MTBF of 40 hours and has an MTTR of 2 hours.

- (i) Which product has higher reliability?**
- (ii) Which product has greater maintainability?**
- (iii) Which product has greater availability?**

(c) The probabilities of failure p_n of an equipment in the n^{th} period after maintenance have been estimated as follows :

n	1	2	3	4
p_n	0.1	0.2	0.4	0.3

Cost of preventive maintenance : Rs.150

Cost of breakdown maintenance : Rs 1000

Determine the optimum frequency of preventive maintenance.

Answer 6.

- (a) While designing a maintenance programme the main objective of management should be to reduce the total cost of maintenance without sacrificing the efficiency and effectiveness of the plant. The following points are to be considered while designing a maintenance programme:
 - (i) The maintenance operation should increase the life of the asset at affordable cost.
 - (ii) The maintenance programme should not affect the normal working of the plant. This involves proper planning, having spare machines etc.
 - (iii) Manpower required for maintenance plan should determined and proper training should be imparted to them.

- (iv) The equipments may be classified according to their criticality.
- (v) Lubrication schedules should be prepared, spares and equipment replacement policy should be decided.
- (vi) The maintenance plan should be communicated to all concerned.
- (vii) Modern techniques like OR, PERI to be employed in carrying out maintenance.
- (viii) Maintenance standard time may be fixed.
- (ix) The programme itself may have to be modified in light of the experience gained.

- (b) (i) The product having higher MTBF will be more reliable, as it will have a lesser chance to fail during service. Product B has higher MTBF (40hrs.) So it is more reliable.
- (ii) MTTR means time by which the machine can be repaired and put to use. Since MTTR of B is less than that of A, it has a greater maintainability.
- (iii) The availability may be computed as follows :

$$\begin{aligned}
 \text{Availability of A} &= \text{MTBF}/(\text{MTBF} + \text{MTTR}) * 100 \\
 &= 30/(30 + 5) * 100 \\
 &= 30/35 * 100 \\
 &= 85.7\%
 \end{aligned}$$

$$\begin{aligned}
 \text{Availability of B} &= \text{MTBF}/(\text{MTBF} + \text{MTTR}) * 100 \\
 &= 40/(40 + 2) * 100 \\
 &= 40/42 * 100 \\
 &= 95.2
 \end{aligned}$$

- (iii) (a) It has been assumed that equipments that fail are replaced just before end of the week.
- (b) Actual percentage of failures during for equipments of same age is same as the expected percentage of failure during the period for them.

Period	Prob. of failure p_n	No. of replacements made at the end of n^{th} period.	Cost of breakdown maintenance	Cost of preventive maintenance	Total cost of maintenance	Cost per period
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	0.1	0.1	$0.1 * 1000 = 100$	150	250	250
2	0.2	$0.2 + (0.1 * 0.1) = 0.21$	$0.21 * 1000 = 210$	150	$250 + 210 = 460$	$460/2 = 230$
3	0.4	$0.4 + (0.21 * 0.1) + (0.1 * 0.2) = 0.4 + 0.021 + 0.02 = 0.441$	$0.441 * 1000 = 441$	150	$460 + 441 = 901$	$901/3 = 300.3$

Therefore optimum frequency of preventive maintenance is once in 2 periods and expected cost of maintenance is Rs.230.

Q7. (a) Define work sampling. Write down the formula indicating terms used for determining the sample size.

- (b) In a sampling study, a machine is found to be idle 20% of the total time available for operation. Find out how many observations are required to arrive at a more accurate estimate with a confidence level of 95% and +/- 5 % error limit.

Answer 7.

- (a) Work sampling is a work measurement technique in which a sufficient large number of instantaneous observations of an worker or machine are taken over a period of time to obtain a reasonably accurate picture of the time spent on different activities. It is based on statistical theory of sampling. Work sampling is thus a method of finding out percentage occurrence of a certain activity or delay by statistical sampling. The procedure of work sampling consists of following steps:
- The purpose of study to be determined first.
 - The worker or machine to be identified.
 - The operations to be observed to be decided.
 - The number of observations to be made to be decided.
 - The activity performed at each visit to be recorded.
 - Percentage of total time spent on each activity to be calculated.
 - Standard time is established by adding allowances.

The formula deciding the sample size is as follows:

$$n = \{4p(1-p)\} / s^2 p^2 \text{ where,}$$

n = sample size
p = extent of activity being observed.
s = accuracy of sample results.

(b) $n = \{4p(1-p)\} / s^2 p^2$
 $p = 0.2$
 $1-p = 0.8$
 $s = 0.05$
 $n = 4 * 0.2 * 0.8 / (.05)^2 * (.2)^2$
 $= .8 * .8 / .0025 * .04$
 $= 6400$

Q8. (a) Distinguish between Quality of Design and Quality of Conformance

(b) What causes variations in Quality?

- (c) AB Ltd. manufacturer of floppy disks inspects a sample of 50 disks from each days output. Data relating to number of defectives over past 20 days is given below:

Date	No. of defectives
18.2.08	3
19.2.08	10
20.2.08	13
21.2.08	4
22.2.08	12
23.2.08	14
24.2.08	8
25.2.08	7
26.2.08	19

27.2.08	1
28.2.08	0
1.3.09	4
2.3.09	9
3.3.09	22
4.3.09	7
5.3.09	6
6.3.09	18
7.3.09	3
8.3.09	9
9.3.09	7

As per production manager variation in quality was due to deputation of inexperienced substitute operator instead of regular one on 3 days during this period. With use of control charts specifying upper and lower control limits, determine the days of poor quality which can be assigned to the inexperienced operator. Do the number of such days match the number of points indicating out of control situation ?

Answer 8.

a) Difference between Quality of Design and Quality of Conformance :

Quality of design	Quality of conformance
Refers to manufacturing specification of product. It consists of appearance, life, safety and other features of product.	Refers to degree to which the product actually conforms to design specification.
Higher quality means higher cost.	Higher quality means lower cost.

b) Variation in quality occurs due to chance causes and assignable causes. Chance causes are inherent in the process .It is difficult and uneconomical to detect and eliminate them. They are random and independent of each other and are natural and permissible.

Assignable causes are due to improper raw material, bad working, or negligence on part of the worker. They are non random, identifiable, and controllable.

$$\begin{aligned}
 \text{c) Proportion of defectives} &= \text{Total no. of defectives/No. of observations.} \\
 &= 176/(20 \times 50) \\
 &= 76/1000 \\
 &= 0.176
 \end{aligned}$$

$$\begin{aligned}
 \text{Sd} &= \text{square root of } p(1-p)/n \\
 &= \text{square root of } 0.176 \times (1-0.176)/50 \\
 &= \text{square root of } 0.0029 \\
 &= .054
 \end{aligned}$$

p = proportion of defective

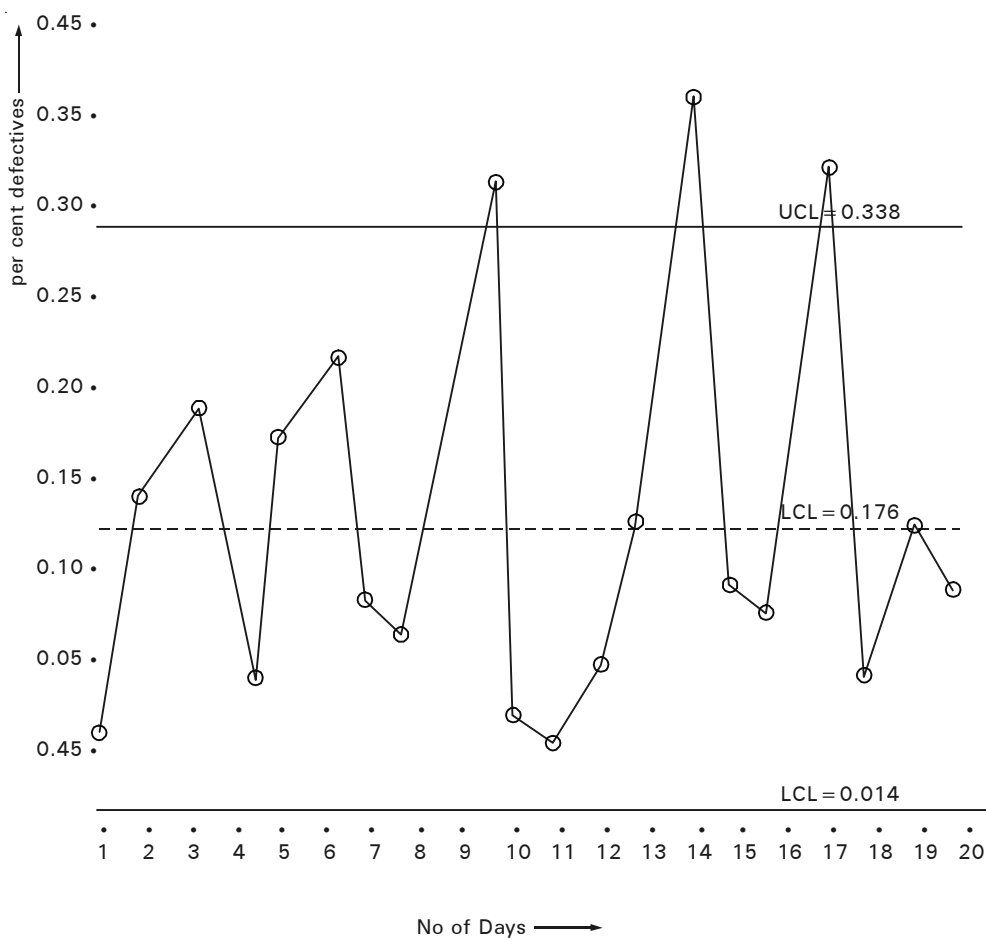
n = sample size

Therefore $UCL = p + 3sd = 0.176 + 3 \times 0.054 = 0.176 + 0.162 = 0.338$

$LCL = p - 3sd = 0.176 - 3 \times 0.054 = 0.176 - 0.162 = 0.014$

$CL = p = 0.176$

Plotting the chart datewise, we find data outside the chart on 26/2, 28/2, 2/3 and 5/3 respectively. Ignoring 28/2, on other three days poor quality may be assigned to inexperienced operator. So production manager's assertion is right.



Q9. Describe in brief the concept of FMS. What are its advantages and disadvantages?

Answer 9.

A Flexible Manufacturing System is a hybrid between continuous and intermittent flow of production. Here, using computer controlled machine and automated material handling equipment, a continuous flow is instilled in otherwise high variety, low production volume flow. Thus FMS is built on the

programmable automation of NC and CNC machines. Programs and tooling set up can be quickly changed and production can be switched on from one job to another without any loss of change-over time.

Key components of FMS are :

- i) Several computer controlled workstations having CNC machines and robots for loading and unloading.
- ii) Computer controlled transport systems for moving materials and parts from one machine to another.
- iii) Computer controlled robots for loading and unloading stations.
- iv) An automated storing and retrieval system.

The above subsystems of FMS are controlled by a central computer with the needed software.

Advantages of FMS can be broadly divided into following :

- i) Flexibility: With slight changes in programs the system can be used with less recurring capital investment.
- ii) Adaptability: With little training the supervisors can take up family of jobs earmarked to the system.
- iii) Wider scope: Advanced manufacturing technology continuously opens newer application areas.
- iv) Lesser human effort results in less amount of human error.
- v) Improved productivity through better quality, effective control of a small area.

Disadvantages of FMS are as follows:

- i) High initial capital investment.
- ii) Limited ability to adopt to production changes.
- iii) Substantial preplanning, tooling and fixture requirements.
- iv) Standardisation of part design required to reduce the number of tools.
- v) Long planning required to install FMS.

Q10. (a) Two alternative methods X and Y using different tooling set-ups may be employed to manufacture a component on a particular machine tool whose operating cost is Rs. 20 (including wages of operator) per hour.

Particulars	Method X	Method Y
Component	4000 pieces	3000 pieces
Cost of tooling	Rs. 320	Rs.1500
Production rate per hour	10 pieces	15 pieces

Justify with suitable calculation which of the two methods would you choose as being more economical for regular production? Would your answer be different if only 1000 pieces of particular component are required?

- (b) Perfect Machine Tools Ltd. requires 4000 pieces of a bought out component in a year. Price of the item is Rs. 3 and it has been estimated to cost Rs. 60 to place an order. If carrying cost is 25% of the value of inventory held, find the optimum size of order.**

Answer 10.

a) The unit cost of two methods are as follows:

	Method X	Method Y
Cost of tooling	Rs. 320	Rs. 1500
Hours required	$4000/10 = 400$	$3000/15 = 200$
Operating cost	$400 * 20 = \text{Rs. } 8000$	$200 * 20 = \text{Rs. } 4000$
Total production costs	Rs. 8320	5500
No. of pieces	4000	3000
Cost per piece	Rs. 2.08	Rs. 1.83

Therefore Method Y is more economical.

If only 1000 pieces are required the cost would be as follows:

	Method X	Method Y
Cost of tooling	Rs. 320	Rs. 1500
Hours required	$1000/10 = 100$	$1000/15 = 66.67$
Operating cost	$100 * 20 = 2000$	$66.67 * 20 = 1333.4$
Total cost of production	2320	2833.40
Cost per unit	Rs. 2.32	2.83

In this case X is cheaper.

b) The formula for calculating economic order quantity is as follows:

$$\begin{aligned}
 \text{EOQ} &= \text{Square root of } [2 * \text{Annual Requirement} * \text{Ordering Cost}] / \text{Cost per unit} * \text{carrying cost} \\
 &= \text{Square root of } [2 * 4000 * 60] / 3 * 0.25 \\
 &= \text{Square root of } 640000 \\
 &= 800
 \end{aligned}$$

Thus optimum ordering cost is 800 pieces.

Q11. (a) Explain the meaning of plant layout.

(b) What are the principles to be borne in mind while designing a plant layout.

Answer 11.

- (a) Plant layout implies physical arrangement of machines, equipments and other facilities on the factory floor in such a manner that they may be handled efficiently. Plant Layout, also known as layout of facility refers to the configuration of departments, work-centres and equipment and machinery with focus on the flow of materials or work through the production system. Plant layout or facility layout means planning for location of all machines, equipments, utilities, work stations, customer service areas, material storage areas, tool servicing areas, tool cribs, aisles, rest rooms, lunch rooms, coffee/tea bays, offices, and computer rooms and also planning for the patterns of flow of materials and people around, into and within the buildings. Layout planning involves decisions about the physical arrangement of economic activity centres within a facility. An economic activity centre can be anything that consumes space, a person or group of people, a machine, a work station, a department, an aisle, a

store room and so on. The goal of layout planning is to allow workers and equipments to operate more effectively.

(b) **Plant Layout- Principles :**

The layout selected in conformity with layout principles should be an ideal one. These principles are :

- **Principle of Minimum Travel:** Men and materials should travel the shortest distance between operations so as to avoid waste of labour and time and minimise the cost of materials handling.
- **Principle of Sequence:** Machinery and operations should be arranged in a sequential order. This principle is best achieved in product layout, and efforts should be made to have it adopted in the process layout.
- **Principle of Usage:** Every unit of available space should be effectively utilised. This principle should receive top consideration in towns and cities where, land is costly.
- **Principle of Compactness:** There should be a harmonious fusion of all the relevant factors so that the final layout looks well integrated and compact.
- **Principle of Safety and Satisfaction:** The layout should contain built in provisions for safety for the workmen. It should also be planned on the basis of the comfort and convenience of the workmen so that they feel satisfied.
- **Principle of Flexibility:** The layout should permit revisions with the least difficulty and at minimum cost.
- **Principle of Minimum Investment:** The layout should result in savings in fixed capital investment, not by avoiding installation of the necessary facilities but by an intensive, use of available facilities.

Q12. (a) What is Human Resource Planning? Explain the steps involved in HRP.

(b) State the importance of HRP to an organization.

Answer 12.

- (a) HRP is a process of striking balance between human resources required and acquired in an organisation. In other words, HRP is a process by which an organisation determines how it should acquire its desired manpower to achieve the organisational goals. Thus, HRP helps an organisation have the right number and kind of people at the right places and right times to successfully achieve its overall objectives. Human resource planning is a process of determining and assuming that the organisation will have an adequate number of qualified persons, available at the proper times, performing jobs which meet the needs of enterprise and which provide satisfaction for the individuals involved.

HRP is the process- including forecasting, developing and controlling-by which a firm ensures that it has the right number of people and the right kind of people at the right places at the right time doing work for which they are economically most useful.

HRP can be defined as the comparisons of an organisation's existing labour resources with forecast labour demand, and hence the scheduling of activities for acquiring, training, redeploying and possibly discarding labour. It seeks to ensure that an adequate supply of labour is available precisely when required.

HRP could be seen as a process, consisting of the following series of activities:

1. Forecasting future personnel requirements, either in terms of mathematical projections of trends in the economy and developments in the industry, or of judgements estimates based upon specific future plans of the company.
 2. Inventing present manpower resources and analysing the degree to which these re-sources are employed optimally.
 3. Anticipating Manpower Problems by projecting present resources into the future and comparing them with the forecast of requirements, to determine their adequacy, both quantitatively and qualitatively.
 4. Planning the necessary programmes of recruitment, selection, training, employment, utilisation, transfer, promotion, development, motivation and compensation so that future man power requirements will be duly met.
- (b) Human resource planning is important to organisation because it benefits the organisation in several ways.

The important ones are mentioned below :

1. By maintaining a balance between demand for and supply of human resources, human resource planning makes optimum use of human resources, on the one hand, and reduces labour cost substantially, on the other.
2. Careful consideration of likely future events, through human resource planning might lead to the discovery of better means for managing human resources. Thus, foreseeable pitfalls might be avoided.
3. Human resource planning compels management to assess critically the strength and weaknesses of its employees and personnel policies on continuous basis and, in turn, take corrective measures to improve the situation.
4. Human resource planning helps the organisation create and develop training and succession planning for employees and managers. Thus, it provides enough lead time for internal succession of employees to higher positions through promotions.
5. Human resource planning meets the organisation need for right type of people in right number at right times.
6. It also provides multiple gains to the employees by way of promotions, increase in emoluments and other perquisites and fringe benefits.
7. Last but no means the least, with increase in skill, knowledge, potentialities, productivity and job satisfaction, organisation becomes the main beneficiary. Organisation is benefited in terms of increase in prosperity /production, growth, development, profit and, thus, an edge over its competitors in the market.
8. Manpower shortfalls and surpluses may be avoided, to a large extent.
9. Some of the problems of managing change may be foreseen and their consequences mitigated. Consultations with affected groups and individuals can take place at an early stage in the change process. This may avoid resistance for change.
10. Through human resource planning, duplication of efforts and conflict among efforts can be avoided, on the one hand, and coordination of worker's efforts can be improved, on the other.

Q13. Differentiate between:

- i) **Cost control and cost reduction.**
- ii) **Production and productivity**
- iii) **Job Analysis and Value Analysis**

Answer 13.**i) Cost control and cost reduction.**

Cost Reduction	Cost Control
i) It is corrective function.	It is preventive function
ii) Emphasis is on present and future cost.	Emphasis is on present and past behaviour of cost.
iii) Challenges the cost standards itself and tries to reduce cost on continuous basis.	Involves setting standards, analyzing variances and taking corrective actions.
iv) Can be applied to each and every area of business.	Limited to areas where standards can be set.
v) Calls for change in conditions if that leads to lowering in cost.	Aims at lowest possible cost under given conditions.
vi) The programme can be finished	It is ongoing or never ending process

ii) Production and productivity

Production and productivity are not synonymous. Production refers to the volume, value or quantity of goods and services produced during a given period by a worker, plant, firm or economy. It is the sum total of results achieved by the various factors used together. Productivity, on the other hand, is not concerned with the volume of production. It is the ratio of output and input factors of an enterprise. It shows the efficiency of production or the efficiency level of input factors. In other words, productivity is relative to the resources used in turning out a certain amount of physical output, while production is used, more or less, in absolute sense. The distinction between two terms becomes more clear when we find that increase in production does not necessarily mean the increase in productivity. If increase in production is attributed to the increase in the inputs of production in the same proportion, the production will have increased but productivity may have declined or may remain constant because the ratio of output and inputs has shown a decline or has not shown any improvement.

iii) Job Analysis and Value Analysis

Job Analysis	Value Analysis
a) Process of determining task components or work content of a job so as to access relative worth of different jobs.	Systematic application of established techniques to identify functions of product or component and to provide those functions at lowest possible cost.
b) Technique of merit rating	Technique of cost reduction

- Q14. (a) How do you classify Waste? Discuss the features of an effective Waste Disposal System.**
(b) How can an organization control pollution?

Answer 14.

- (a) There are various ways in which one could categorise waste. However, the generally accepted classification is given below:
- (i) Classification on the basis of Resources, i.e., how much of a particular resource has been wasted.
 - (ii) Classification on the basis of property i.e. whether the materials that have been wasted are hazardous to life and environment or whether they fall in the category of non-hazardous.
 - (iii) Classification on the basis of the recoverability of resources.
 - (iv) Classification on the basis of origin of waste, i.e., whether it is commercial waste or industrial waste, residential waste or office waste and construction waste or agricultural waste.

The salient features of an effective waste proposal system are as follows:

- 1. Easy to install and operate.
 - 2. Economical from the cash outflow point of view.
 - 3. Convenient and not highly complex.
 - 4. Within the budgetary constraints.
 - 5. Approved by the legislation and other statutory authorities in force.
 - 6. Flexibility and not rigidity in operations.
 - 7. Economies of scale.
 - 8. Does not require highly skilled labour force for its operation.
 - 9. Adaptability in the context of the needs and objectives of the organisation.
- (b) Pollution cannot effectively be controlled by the use of a single technique. Since the causes and the effects of different types of pollution are diverse and distinct from each other, there cannot be any thumb- rule or golden rule which could be applied in the present context. However, in general, a prudent use of the techniques given below, in conjunction with other appropriate measures, is bound to bring in the desired results. These are :
- 1. Controlling at source.
 - 2. Controlling during processes, operations and other activities.
 - 3. Control by suitable enclosures.
 - 4. Control by protection.
 - 5. Control by preventions.
 - 6. Control by absorption.
 - 7. Adhering to regulations laid down by the following authorities:
 - (a) Respective state governments.
 - (b) Central Government.
 - (c) Guidelines issued by the global bodies representing individual pollution control measures.
 - (d) Ensuring compliance with any other law for the time being in force.

Q15. Write short notes on:

- a) **Input-Output Analysis.**
- b) **Factors affecting business forecast.**

Answer 15.**a) Input-Output Analysis.**

Input-output analysis reflects a general theory of production based on the idea of economic interdependence. Many input - output models are useful in forecasting. Input - output analysis

takes into consideration the interdependence of the different sectors in the economy. This is because; the input to one sector is output of another sector. For example, the output of coal industry will be an input to the steel plant and the output of steel industry is an input to the construction industry and so on. There are many such cyclic relations within the various sectors of economy. Taking the data of outputs and inputs and studying the relationship between these two, we will be in a position to analyse the total demand for a product and the output required from industrial units. This type of analysis is very important because it takes into account all the intricate relationships in the economy. One of the limitations in this method is that the utility of an output is restricted to economic analysis, not considering the other business, governmental, technological and internal factors. It is limited but useful analysis. The analysis need not be limited to macro-level, speaking only in terms steel sector and coal sector etc. It may be mote 'micro', by considering the inputs and outputs within a general product group in the total economy. This type of analysis is very much used and is found more beneficial and useful. Three major assumptions in developing this technique are:

1. The total output of an industry is consumed as input by all industries for a time period, under consideration.
2. The input bought by each industry has usually been made dependent only on the industry's level of output.
3. The ratio of an industry's input to its output, once established is fixed. This ratio is known as input output number or production coefficient.

Input-output analysis is a mathematical study of an economy in which different production sectors such as agriculture, industry and services etc. have interdependence. Thus, in input-output analysis, we try to analyse quantitatively the interdependence of inputs and outputs of various industries and find the equilibrium between the inputs and output of each industry, plant, sector or economy. The output of any industry depends very much on its inputs and these inputs are the outputs of other industries. This analysis signifies to foretell the total production per sector and its demand in other industries.

It can be presented as: Total output of all sectors = Total inputs of all sectors.
or, output of an industry = Total inputs of that industry.

This input-output analysis is also known as 'analysis of inter-industry or inter-sector flows or deliveries or analysis of inter-industry relations.'

Input-output analysis can be used in the following cases :

1. The input-output analysis can be used for the study of variation in productivity of an enterprise. This analysis is based on index-numbers, using value added measure for output and the measures of inputs all at constant prices. The value added in each industry can be obtained by subtracting the value of inputs used from the value of gross output.
2. Input-output table has a historic importance showing a record of past and can be a very useful instrument in economic analysis and framing economic policy. In developed countries, this analysis is used for economic forecasting and in developing countries, for economic planning or programming. In business world, business forecasting can be done by this analysis.
3. This analysis can be very usefully used for a comparative study of growth by examining. By examining country-wise or sector or region-wise or plant, firm or industry-wise differences in input-output coefficients, the process of growth can be more easily interpreted.
4. This analysis can be utilised to determine the impact of some major exogenous changes in the economy on other factors of production.

b) Factors affecting business forecast.

Forecasting means peeping into the future. As future is unknown and is anybody's guess but the business leaders in the past have evolved certain systematic and scientific methods to know the future by scientific analysis based on facts and possible consequences. Thus, this systematic method of probing the future is called forecasting. In this way forecasting of sales refers to an act of making prediction about future sales followed by a detailed analysis of facts related to future situations and forces which may affect the business as a whole. Foresight is not the whole of management, but at least it is an essential part of management and accordingly, to foresee in this context means both to assess the future and make provisions for it, that is forecasting is itself action already. Forecasting as a kind of future picture wherein proximate events are outlined with some distinctness, while remote events appear progressively less distinct and it entails the running of the business as foresee and provide means to run the business over a definite period.

Various factors that influence the forecast are:

- (i) Environmental changes,
- (ii) Changes in the preference of the user,
- (iii) Number of competitive products,
- (iv) Disposable income of the consumer.

In forecasting the production important factors to be considered are:

- (i) Demand from the marketing department,
- (ii) Rate of labours absenteeism,
- (iii) Availability of materials,
- (iv) Available capacity of machines,
- (v) Maintenance schedules,
- (vi) Delivery date schedules.

INFORMATION SYSTEM

Q1. Fill in the blanks :

- i) _____ is the contraction of the term binary digit.
- ii) An extra bit in a byte that enables the computer to check for internal errors is called _____ bit.
- iii) Laser printer is a _____ printer.
- iv) The range of frequencies available for data transmission is called _____.
- v) The activities of an Information System is collection, generation and _____ of information to right users.
- vi) An area of computer which can only be read is called _____.
- vii) _____ is the physical computer which is used for processing data.
- viii) ORACLE is a software package for _____.
- ix) A computer network in which there is no host and in which all stations are equal is called a _____ network.
- x) Eliminating errors of a program is called _____.
- xi) Multiprogramming is processing of a number of programs simultaneously by using the technique of _____.
- xii) _____ means browsing with any predetermined search material.
- xiii) Intranet is a in-house version of _____.
- xiv) _____ is a specially designed tool to feed executives information need.
- xv) SAP AG is a popular _____ package.
- xvi) _____ is an electronic device that converts digital signal to analog signal and vice-versa.
- xvii) Use of external parties to provide goods and services to the organization is known as _____.
- xviii) Microsoft excel is a _____ package.
- xix) Hybrid testing is also known as _____ testing.
- xx) Bootstrapping means loading _____ in Computer after switching on the power.

Answer 1.

- (i) BITS.
- (ii) Parity.
- (iii) Non-impact.
- (iv) Bandwidth.
- (v) Dissemination.
- (vi) ROM.
- (vii) Hardware.
- (viii) DBMS.
- (ix) Ring.
- (x) Debugging.
- (xi) Time-sharing.
- (xii) Surfing.
- (xiii) Internet.
- (xiv) EIS.
- (xv) ERP.

- (xvi) MODEM.
- (xvii) Outsourcing.
- (xviii) Spreadsheet.
- (xix) Sandwich.
- (xx) Operating System.

Q2. State whether following statements are true or false:

- (i) OCR is a Output device.
- (ii) Evolution of Information Systems can be distinctly divided into 5 generations.
- (iii) HLL converts source program into Machine Language Program.
- (iv) ALU is a component of CPU.
- (v) RAM is volatile, i.e contents are lost when power is switched off.
- (vi) Virtual memory is provision of secondary storage which acts as secondary memory.
- (vii) Inkjet is a non-impact printer
- (viii) Multiplexer facilitates use of multiple lines to connect multiple computers.
- (ix) Viewing a taped television show is an example of synchronous communication.
- (x) BASIC is suitable for both scientific and commercial applications.
- (xi) Virus and bug are not synonymous.
- (xii) Processing is done in primary storage unit.
- (xiii) Cursor is a communication device between user and machine.
- (xiv) Hierarchical database structure cannot represent 'many to many' relationship.
- (xv) DBMS software does not support query language.
- (xvi) Normalisation works on the principle that same data may be stored in number of places.
- (xvii) Network OS controls hardware devices, software, communication media and channels.
- (xviii) Mail server sends mail to e-mail address of the receiver.
- (xix) Check digit is a system of adding an extra digit to each character in order to check loss of bits during data transfer.
- (xx) Hacking is unauthorised access to software and information.
- (xxi) Protocol is geometric arrangement of computer resources.
- (xxii) A modem provides the connection between server and work station.

Answer 2.

- (i) False.
- (ii) True.
- (iii) False.
- (iv) True.
- (v) True.
- (vi) False.
- (vii) True.
- (viii) False.
- (ix) False.
- (x) True.
- (xi) True.

- (xii) False.
- (xiii) True.
- (xiv) True.
- (xv) False.
- (xvi) False.
- (xvii) True.
- (xviii) True.
- (xix) False.
- (xx) True.
- (xxi) False.
- (xxii) False.

Q3. Match Column I with relevant terms in column II :

Column I	Column II
i) Scanner	a) Output device
ii) SVGA	b) Batch Total
iii) FORTRAN	c) Volatile
iv) URL	d) Provides information about location of a document.
v) Star	e) Input device
vi) DRAM	f) Programming Language
vii) VA	g) Secondary storage
viii) VB	h) Control Total
ix) Input Control	i) Supports GUI features.
x) Processing Control	j) Common communication channel

Answer 3.

Column I	Column II
i) Scanner	e) Input device
ii) SVGA	a) Output device
iii) FORTRAN	f) Programming Language
iv) URL	d) Provides information about location of a document.
v) Star	j) Common communication channel
vi) DRAM	c) Volatile
vii) VA	g) Secondary storage
viii) VB	i) Supports GUI features.
ix) Input Control	b) Batch Total
x) Processing Control	h) Control Total

Q4. Expand the following terms :

- (i) EIS
- (ii) ASCII
- (iii) DEC
- (iv) DRAM
- (v) MDR
- (vi) OCR
- (vii) GUI
- (viii) ISAM
- (ix) IP
- (x) OLAP
- (xi) ALGOL
- (xii) EBCDIC
- (xiii) APRANET
- (xiv) WAIS
- (xv) www
- (xvi) SET
- (xvii) SAP
- (xviii) DBA
- (xix) RADIUS
- (xx) UPS

Answer 4.

- (i) Executive Information System.
- (ii) American Standard Code for Information Interchange.
- (iii) Digital Equipment Corporation.
- (iv) Dynamic Random Access Memory.
- (v) Monochrome Display Adapter.
- (vi) Optical Mark Reader.
- (vii) Graphical User Interface.
- (viii) Indexed Sequential File.
- (ix) Internet Protocol.
- (x) On-line Analytical Processing.
- (xi) Algorithmic Language.
- (xii) Extended Binary Coded Decimal Interchange.
- (xiii) Advanced Research Project Agency Network.
- (xiv) Wide Area Information Service.
- (xv) World Wide Web.
- (xvi) Secure Electronic Transaction.
- (xvii) Standard Auditing Practices
- (xviii) Database Administrator
- (xix) Remote Authentication Dial In User Service
- (xx) Uninterrupted Power Supply

Q5. Distinguish between :**i) Hardware and software****ii) Third generation and Fourth generation languages****Answer 5.****i) Hardware and Software**

Hardware	Software
Physical components of a computer system are called hardware.	Collection of programs designed for specific needs is called software.
Input devices, processing unit, output devices and auxiliary storage devices are different categories of hardware.	Software can be divided into three types- application software, system software and general-purpose software.
Keyboard, mouse, printer, CPU, RAM are examples of hardware	Financial Accounting software, operating system, MS-WORD etc. are examples of software.
Hardware is manufactured/assembled by hardware manufacturing companies/ hardware vendors.	Software is developed by software development firms.
Hardware is independent of software.	Software cannot be developed/used without hardware i.e. software is dependent on hardware.
Hardware repair requires hardware engineer.	Software development/modification requires software professionals like application programmer and system programmer.
It is bulky and requires more storage space.	Software can be copied on CD/DVD, which is lightweight and transportable.
Hardware is supported by uninterrupted power supply (UPS).	Software operation requires requisite hardware.
Hardware can be assembled, Indian branded or of MNC brand.	Software can be licensed or pirated.

ii) Third Generation and Fourth Generation Languages

Third Generation Languages are called procedural languages and they are procedure oriented. They employ plain English like and mathematical expressions. They are intended for professional programmers, and require specification of how to perform task. Programmes written in third generation languages are also difficult to debug and usually translated through compiler. Code is difficult to learn, understand and maintain. These languages were originally developed for batch operations and are typically file oriented. FORTRAN, COBOL etc. are examples of third generation languages.

Fourth Generation Languages(4GLs), on the other hand, can be used by both programmers and non-programmers. 4GL uses English like instructions, has limited mathematical manipulation capability. It offers automatic report formatting, sequencing and record selection by user given criteria. However, 4GLs are less efficient than third generation languages. They require specification of what task to perform and the system determines how to perform that task.

4GL requires fewer instructions, code is easy to maintain and understand. Many features of 4GLs can be learned quickly. 4GLs are more structured and are data base oriented. Generally, these are available in two types (i) Production Oriented and (ii) User Oriented

Q6. (a) What is Information? How does it differ from Information System.

(b) Describe the characteristics of an Information System.

(c) Explain why information system die.

Answer 6.

- (a) Information is data that has been processed into meaningful form so that it can be effectively interpreted and help the user in decision making. Information consists of data, text, images, voice etc. On other hand, Information System is the vehicle that supplies necessary information for decision making. The information system is to feed the management for control purpose. The activities in an information system are :
- (i) collection, storing and processing of data.
 - (ii) generation of information reports.
 - (iii) dissemination of information to right users.
- (b) **Characteristics of an Information System** : The following are the general characteristics of an Information system :
- (i) **Specific objective** : The information system should have some specific objective. An Information System in highly scientific research centre will have an objective to accumulate data from different activities, display of some information instantly for controlling activities and son on. In a business environment, the objective will be sharing information from different functional areas and smooth flow of information for management decision making.
 - (ii) **Structured** : An information system have a definite structure with all modules of sub-systems. The structure depends on the sub-modules, their interactions and integration requirements, operational procedure to be followed and the solution sets. The structure of the information system refers to diagrammatic representation of the system showing sub-systems, their inter-relation and the procedure to be followed to fulfill the process requirements.
 - (iii) **Components** : The sub-system are the components. The sub-systems should be distinguishable among themselves but have well-defined relation among. For example, a Sales system may be sub-systems like Invoicing, Delivery monitoring, and Sales Proceeds Collection system. The inter-link between these systems must be well defined.
 - (iv) **Integrated** : An Information System should be designed in such a fashion that proper integration among sub-systems are taken care to establish correct linkage and generate meaningful information. An information in isolation may not be that meaningful but its usage is improved if it is integrated with information of other closely related issues. For example, Sales information of a region becomes more meaningful if other information like previous period sales, sales in other regions, sales of competitive products are also combined in the information set.
 - (v) **Life-Cycle** : An Information system will have its own life-cycle. The duration of life cycle varies from the system to system. An information system has the similar stages of life-cycle as seen in any other system. Every information system will have distinctly phases — Initial, Growth, Maturity and Decline.

- (vi) **Behaviour** : A system has its own set reaction and outcome depending on the environment. A well managed business information system behaves nicely with its users by satisfying them with correct and timely information. The design of the system plays a good role in setting its behaviour pattern.
- (vii) **Self-regulatory** : An Information System which may have different sub-systems interacting with the each other in a desired fashion to be operative smoothly and in the process they regulate themselves. This is what is self-regulatory nature of the system. A payroll system involves three activities—first, maintaining attendance of employees, second, pay calculation and third pay disbursement. If the target date for pay disbursement is last date of a month, the second adjusts its start time accordingly and the first one is also regulated in such a fashion that it can provide input to the second in time.
- (c) Information Systems die due to changes in information requirement and information becoming outdated due to :
 - (i) changes in business environment
 - (ii) changes in users' expectation
 - (iii) changes in technology
 - (iv) deterioration in software quality due to passage of time

Q7. Write short notes on:

- a) ALU
- b) Virtual Memory
- c) Bootstrapping
- d) Virus
- e) HLL

Answer 7.

- (a) ALU-Arithmetic and Logical Unit is a component of Central Processing Unit of Computer Hardware. It has three gates –mathematical gates, logic gates and register. Mathematical gates perform mathematical function, logic gates are involved in logical operations and register acts as temporary storage for data. Arithmetic operations means addition only, whereas subtraction is addition of complements, multiplication is repetitive addition and division is repetitive addition of complements. Logical operations basically involve comparing, selecting and matching of data.
- (b) Virtual Memory: Virtual Memory is a secondary storage facility acting as primary memory in a Computer System. When the size of main memory is less than required size for a program to run, the operating system enables it with the help of hard disk (main storage media). The system followed is breaking the programs and accommodating the part according to the size of main memory available and rest is stored in hard disk. When a part of program stored in hard disk is required for running the program, a part of the program stored in the main memory is transferred to hard disk and the required part is brought to main memory. This process is called swapping.
- (c) Bootstrapping: Bootstrapping means loading Operating System in Computer after switching on the power. Bootstrapping instructions are stored in RAM. Once the power is on the computer takes bootstrapping instructions from ROM and loads the OS from Hard-disk into RAM and the computer is put in operation.
- (d) Virus : It is a software which is directed to destroying software or information in a computer. It is generally carried along with a program or data through a device without the knowledge

of the user. The virus software is activated at encountering a particular situation either in terms of time or action. It gets multiplied automatically that means it gets copied from one file to other in an attempt to make the damage wider. There are varieties virus and their actions are different. It destroys software, data file and even file allocation table (FAT). The virus software was developed to interfere with free exchange of program in order to make the users to buy software by paying due price for it to protect the interest of software developers. But its subsequent indiscriminate use has gone beyond ethics to affect the resources and free exchange of programs among the users.

(e) High Level Language (HLL) : High Level Languages were developed in such a fashion that the instructions are alike to English Language so that following the instruction codes and writing programs become easier. This helped the programmers to overcome the shortcomings of low level languages to a great extent. The following are the features of High Level Languages :

- They are English like Languages and easy to learn.
- Standard sets of words and well defined structures are used.
- Program development effort is less.
- Debugging is easy.
- Portability is high.
- It is not machine dependent.
- It was procedure oriented thereby reducing programming effort.

Q8. What is:

i) CBA of a system.

ii) Debugging.

iii) Flow Chart

Answer 8.

(i) Cost - Benefit Analysis: This is basically to justify the financial feasibility of a system. Before a new system is proposed, the benefits derived out of it should be weighted with the cost in it. Cost components which should be covered in the analysis are :

- Investment requirement in hardware procurement /rent
- Cost of software development
- Maintenance of hardware
- Cost of creation/conversion of data files
- Manpower cost
- Cost of computer stationery including floppies, tape etc
- Training cost
- Cost of maintenance of software
- Overhead cost – power, air-conditioning, rent etc

Financial and non-financial benefits from the system are assessed.

Tangible benefits :

- Decrease in data processing cost
- Saving through better information system

Intangible benefits : It is difficult to estimate them. They are like:

- Increased operational efficiency
- Good working environment
- Better information system etc.

Cost and benefits are weighted and observations are made accordingly for proper decision making. Generally System objectives outline the following :

- How the new system meets the changes in requirements
- Technological improvement envisaged
- Skill improvement plan for manpower

- (ii) Debugging a program means eliminating errors in the program. Errors may be of two types - a) Syntax error and b) logical errors

Syntax errors : These are errors due to mistake in following the syntactical structure of the language in which the program is developed or there may be spelling mistake in the use of words and instruction codes. These errors are detected at the time of compilation with the help of a compiler. Unless the syntax errors are corrected, object program will not be generated.

Logical Errors : These are errors in program logic. These are generally detected at the time of execution or testing the program. Due to logical errors, program may fail to run or will generate wrong output report.

- (iii) Flow Chart is the diagrammatic representation of the algorithm i.e. program logic. It uses a unique set of symbols to describe the conditions and actions.

Technique of in drawing flow chart

- Starting with the input for main decision factor
- Putting the condition in the decision box
- Branching the condition into different path of decision box
- Branching should be done without ambiguity
- To remove ambiguity, more than one decision box may be used
- Writing the statements under each branch
- Avoiding crosses in the flow chart
- Using connectors to reduce the number of flow lines, if required.

Advantages of Flow Charts :

- Logical representation of problem steps
- Flow chart helps to make the complex logic simpler

- A visual aid in conceptualization of the problem
- It is tool for efficient programming
- Helps in debugging
- Support program documentation

**Q9. (a) What is a Decision Support System? Illustrate with diagram.
(b) Mention the main components of DSS.**

Answer 9.

- (a) According to CIMA, Decision Support System (DSS) is a collective term to describe the various types of software, principally modelling or simulation, which provide input into management's decision making process. The 'what if?' analysis produced by spreadsheets is a typical example.

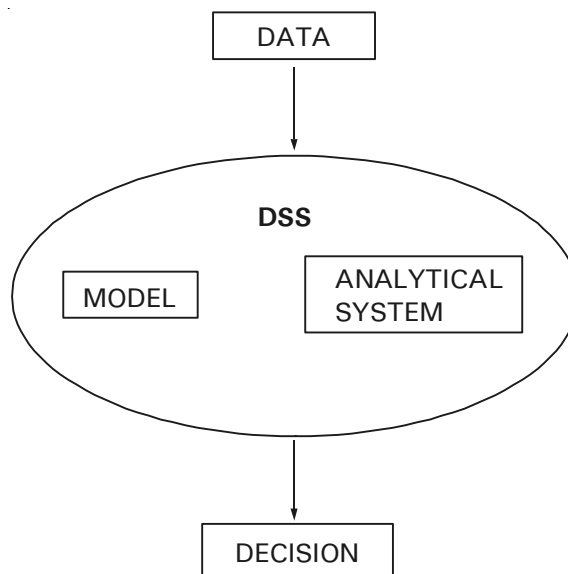
Decision support system is an IT tool based on models for interpretation and analysis of data and presenting the same for facilitating decision making. An expert system is within the DSS so that unstructured problems are also taken care.

Decision Support System has the following three characteristics:

- i) Support semi-structured and unstructured decision making
- ii) Use model for solutions
- iii) Flexible to respond the changing need of the decision maker

Structured or Programmed decision making is with the help of using data in a simple related decision making program which is based on technical knowledge on a particular area. Unstructured or semi-structured decision making process involves a great technical expertise of the all subjects of all related fields and building model to handle the information to derive solution set.

Decision Support System



- (b) A DSS has the following three components :
- (i) **Databases** – A DSS must have one or more databases containing all relevant information. The system will extract the set of information from database with data-mining tools.
 - (ii) **Model base** – Model base is the brain of a DSS. For example, mathematical models on Time Series analysis, Linear Programming, Statistical Quality Control will be tools used to solve many financial problems.
 - (iii) **Technical Expertise** – A DSS system must have technical expertise in the domain field to understand the nature of information, nature of problems, appropriateness of model and additional intelligence required to handle the unstructured or semi-structured problem situations.

**Q10. (a) Explain the terms management, information and system. In this context define MIS.
(b) State the steps involved in implementation of MIS.**

Answer 10.

- (a) Management is the process of getting things done through human efforts to achieve the objectives of the organisation.
Information is data that has been processed into meaningful form so that it can be effectively interpreted and help the user in decision making.

A system is a set of interrelated elements that function as a whole.

MIS is the system of collection, processing, retrieving and transmission of data to meet the information requirement of different levels in an organization.

- (b) For establishment of MIS in an organization, the following steps are followed :

Analytical study on information requirement: A joint efforts by systems experts and management experts is required to understand the exact need of information at different levels of management and how to assimilate them from data flow from different sources. The anticipated change in the need of information may be kept in mind while planning the design in order to provide sufficient flexibility in the system.

Determine the sources of information: Once the first step is understood, it is to see how to get the required information and their sources. If required, data recording system may be changed at different points so that exact data flow is ensured and the same can be done without much hazards. For the sake of simplicity of the system reorientation in the physical flow of data has to be done.

Establishment of right kind of data processing environment: The important step involved in MIS designing is arranging the right kind of tools for processing i.e Computer System and infrastructure in terms of software and skilled manpower. The proper scheduling of processing is equally important to ensure smooth flow of information.

Selection of software: One of the important factors of success for MIS is quality of software. Software must fulfill the following criteria :

- Compatibility of hardware
- Capable of taking load of data volume
- Have the support of software for required database
- Capable of supporting the communication network
- Satisfy the design specification of system architecture – Central data processing or distributed data processing

Database design : In database design the important issues involved are sub-systems in the organization and the logic of integration. Technical knowledge of database and knowledge of application systems, their control requirements and designing of reports are essential for efficient designing of database.

Support of top management : To ensure the smooth functioning of MIS top management support is required. Top management will support only when they are convinced about the benefit of MIS of the organization and confident of efficient performance of processing and regular reporting. Thus, for support of top management, efficiency of MIS has to be established.

Manpower: Arrangement of right kind of manpower with proper skill is the most consideration for successful operation of the system. Proper planning for training of manpower involved in transaction processing and report generation under an MIS system is required to take care of future development of the system.

Integration of information: At the time of designing the data bases, provision for integration of information from different sub-systems is essential so that comprehensive information flow can be of great use for strategic planning.

Evaluation, maintenance and Control: The effectiveness of an MIS system is evaluated by the capacity of its fulfillment of requirement of information by the management. Evaluation is done by ascertainment of the views of the users. Maintenance is needed to take care of the gaps, if any, for further growth and for regular smooth functioning of the system. Control means establishment of checks for input data, processing and output to ensure correctness of reports. Proper maintenance and control on effective operation of MIS required to ensure protection from hazards and smooth functioning on a routine basis.

Q11. Explain the terms:

- (a) 'Going live' in relation to ERP implementation.
- (b) EIS
- (c) Data Warehouse.
- (d) AI

Answer 11.

- (a) **Going Live** : In this phase, the system is to be finally implemented in new environment with real life data set and to the satisfaction of the end-users. In ERP systems, the integration of all the modules is the critical part. The end-users must understanding the sequence of operations, how one module interact with the others and what are the restrictions in operation in terms of priority so as to establish proper checks at all levels in the process. The co-ordination among project members for different modules is very essential for smooth and successful implementation.
- (b) An Executive Information System (EIS) is special type MIS meant for top management of an organization. In other words, it is a Decision Support System (DSS) for Executives. Executive decisions are of three types – strategic planning, tactical planning and 'fire-fighting'. According to CIMA – An Executive Information System (EIS) is a set of procedure designed to allow senior managers to gather and evaluate information relating to the organization and its environment.

Naturally, the EIS takes care of the requirement of information depending upon the type of decisions taken at different levels of managers in an organization. In fact, EIS acts as a tool specially designed for different executives to feed their information need in useful formats.

A manager can navigate a particular format with some amount of computer skill. The EIS is not only limited to internal data source rather facilities to easy access to common sources of external data is also arranged.

Following are the special features of an EIS :

- It a specially designed tool to feed executives information need.
- It is an easy - to - use and screen based software .
- It provides the executives to facilities of on-line analysis tools like time series analysis, regression analysis etc.
- It is not limited to internal data only. Access to external sources of data is also provided.
- It provides the facilities to connect to internet
- Information is presented in summary format
- It is a comprehensive information system and work in conjunction with DSS.

For an Executive Information System, information requirement varies widely according to the requirement to understand the impact of different variables on the issue. For example, for decision of pricing of a product, information requirement may be summed up as follows :

- Recent history of price changes
- Demand for the product
- Graph showing the relationship between demand and price exhibited by recent results
- Effect of demand of changing price over time
- Prices of substitute products
- Price of similar products
- Cost of sales etc.

- (c) The data warehousing is the concept of data integration by way specialized data storage and retrieval technique. The core of data warehousing is multi-dimensional databases. The basic objective of data warehousing is to give right kind of expert analysis of data and feed the decision makers with right kind of information for effective decision to run the business efficiently.

The need for data warehousing has come from increased competition and demand for more and accurate information for precise decision making. Data warehousing can translate the data in common format and store them scientifically for faster access. Combining the related data is the crux in the approach of data warehousing. Thus, database design has a definite key role in making the storage efficient. Providing sensible information is only possible through analysis of related data.

Steps involved :

- Development of hardware and software infrastructure
- Building sound corporate database
- Establishment of communication network
- Managing smooth data flow from multiple operational points
- Building proper check and security measures from misuse

Critical factors involved in data warehousing:

- Heterogeneous data set and their translation in common format
- Organization of database
- Capability of software tool
- Judgement on transactional period for storage of data

Advantages:

- Effective, efficient and convenient data storage
- Elimination of duplication
- Lower cost of storage
- Faster navigation through related information
- Reliable data
- Consistency in reporting
- Better decision making

Strategic use of data warehousing in different business environments:

- Customer Service
- Sales Promotion
- Market analysis of new products
- Trend Analysis
- Inventory Control
- Sales decisions

- (d) Artificial Intelligence refers to behaviour of computer system which seems to be intelligence of the computer itself. As we know, the computer does not have power to act on its own, the intelligent solutions from a computer system is termed to be Artificial Intelligence. In fact, this phenomena is exhibited by a computer system out of the expertise of the software which has the capability to interpret the problem situation and use the knowledge base to evolve intelligent solutions. The artificial intelligence is closely associated with expert system. It is only the expert system which can exhibit artificial intelligence.

Q12. Differentiate Between :

- (a) Ring network and Star network**
- (b) Client-Server Model and Peer- to -Peer Model**
- (c) MODEM and Multiplexer**
- (d) The Internet and the Intranet**
- (e) Intranet and Extranet**
- (f) Internet and World Wide Web.**

Answer 12.

- (a) Ring network and Star network**

Ring network and Star network: In Ring network, the network cable passes from one node to another until all nodes are connected in the form of a loop or ring. There is a direct point-to-point link between two neighboring nodes. These links are unidirectional which ensures that transmission by a node traverses the whole ring and comes back to the node, which made the transmission. Ring networks offer high performance for a small number of workstations or for larger networks where each station has a similar workload. These networks can span longer distances than other types of networks and are easily extendable.

The **Star network structure**, on the other hand, is very popular for LANs. In this topology, the network is characterized by communication channels emanating from centralized computer system. That is, processing nodes in a star network interconnect directly with a central system. Each terminal, small computer, or large mainframe can communicate only with the central site and not with other nodes in the network. If it is desired to transmit information from one node to another, it can be done only by sending the details to the central node, which in turn sends them to the destination. A star network is particularly appropriate for organizations that require a centralized data base or a centralized processing facility. In a Star network, it is easy to add new nodes and also remove nodes. A node failure does not bring down the entire network. It is easier to diagnose network problem through a central hub.

b) Client-Server Model and Peer- to-Peer Model

	Client-Server model	Peer-to-Peer model
	1. In this model, number of computers, known as clients are connected to a single host computer known as server.	In this model, all the computers are interconnected with each other. There is no concept of server and clients. All computers behave as server as well as clients.
2.	It uses a dedicated server which provides various services to clients like hardware, software and data access. Different types of servers can be File, Fax, Print or Database server.	It uses non-dedicated server. Non-dedicated server can also be used as a node for data entry, processing and output operations.
3.	Clients can share disk storage and printers attached with the server.	All computers can share the data/resources of each other.
4.	It is suitable for large organization having large number of nodes.	It is suitable in small organization having less number of nodes upto ten.
5.	Data transfer speed is more.	Data transfer speed is less which decreases even further with the increase in number of computers.
6.	Failure of server results in break-down of entire network.	Failure of one computer will not affect the working of other, only the data stored on the faulty computer will not be accessible to other computers.
7.	Server can not be used for data entry/result purposes, hence it can be said that all the computers are not fully employed.	All the computers are fully employed.
8.	Clients are required to be connected with server in a particular structure like Star Network.	Computers can be connected at any convenient point in the network like Ring Network.
9.	Clients can be dumb terminal or Intelligent terminals.	All computers are intelligent terminals.
10.	This architecture is employed where data security is of prime importance.	This architecture is used when security is not a bigger issue.

(c) MODEM and Multiplexer:

Modem stands for Modulator/Demodulator. It is a device that converts a digital computer signal into an analog telephone signal (i.e. it modulates the signal) and converts an analog telephone signal into a digital computer signal (i.e. it demodulates the signal) in a data communication system. Modems are required to telecommunicate computer data with ordinary telephone lines because computer data is in digital form but telephone lines are analog. Modems can be categorized into internal and external modems.

Multiplexer is a device that enables several devices to share one communication line. A number of devices are connected to the multiplexer. Multiplexer scans each device to collect and transmit data on a single line to the CPU. It also communicates transmission from the CPU to the appropriate terminal linked to the multiplexer. Devices connected to the multiplexer are polled and periodically asked whether there is any data to transmit. Data collected from all terminals are transmitted on same communication line.

(d) The Internet and the Intranet:

The **Internet** is a global network of computer networks that was initiated in the year 1960's by a team of scientists under a U.S. Government contract. There are approximately 1,40,000 small networks in more than 200 countries connected through Internet. These networks are formed by various educational, commercial, Government, non-profit and military organizations. These networks are individually owned and operated that are all interconnected.

Internet is a combination of number of computers, linked together, sharing same resources. There are thousands of databases containing information of all sorts in addition to the facilities like e-mail, chatting, games, message boards and free software.

Networks comprise addressable devices or nodes (computers) connected by communication channels. Any node can transmit a message to any other node, along with communication channels, via the intermediate nodes. Internet uses are many; some of them are given below:

- (a) **Communication** – It could be on-line or off -line.
- (b) **Data Retrieval** – As large number of databases exists on Internet, one can make use of data according to his/her requirements.
- (c) **Data Publishing** – Data publishing is a new opportunity that Internet has made possible. The information can be forwarded to any one.

The **intranet**, on the other hand, is a type of information system that facilitates communication within the organization, among widely dispersed departments, divisions and regional locations. Intranet connects people together with Internet technology using Web Browsers, Web Servers and Data Warehouses in a single view. Within an Intranet, access to all information, applications and data can be made available through the same browser. We can perform the following works :

- Easily accessible information.
- Reduced information searching time.
- Share and reuse of tools and information.
- Reduced set up and update time.
- Reduced documentation cost etc.
- Several applications of Intranet include :

- Supplier management.
- Inventory management.
- Distribution management.
- Channel management.

(e) Intranet and Extranet:

Intranet is a type of information system that facilitates communication within the organization, among widely dispersed departments, divisions and regional locations. Intranets connect people together with Internet technology, using web browsers, web servers and data warehouses in a single view. With an Intranet, access to all information, applications and data can be made available through the same browser. The objective is to organise each individual's desktop with minimal cost, time and effort to be more productive, cost efficient, timely and competitive.

An **Extranet** is an extension of an Intranet that makes the latter accessible to outside companies or individuals with or without an Intranet. It is also defined as a collaborative Internet connection with other companies and business partners. Parts of an Intranet are made available to customers or business partners for specific applications. The Extranet is thus an extended Intranet, which isolates business communication from the Internet through secure solutions. Extranets provide the privacy and security of an Intranet while retaining the global reach of the Internet. An Extranet extends the Intranet from one location to another across the Internet by securing data flows using cryptography and authorization procedures, to another Intranet of a business partner.

(f) Internet and World Wide Web:

Internet is a global network of computer networks formed by various educational, commercial, Government, non-profit and military organizations linked together, sharing same resources. They exchange data and information by packet switching and using the standard 'Internet Protocol' (IP). Besides data exchange, it also provides the facilities like e-mail, chatting, games, message boards, etc.

World Wide Web (WWW) is a component of the Internet that provides access to large amounts of information located on many different servers. It also provides access to many of the services available on the Internet. It contains collection of interconnected documents and other resources which are linked through hyperlinks and URLs.

Q13. Explain the working principle of Electronic Data Interchange (EDI).

Answer 13.

Electronic Data Interchange (EDI): EDI is the transmission of business information in standard format between computers of independent organizations. There is no need to change the database structure by the companies for implementation of EDI. However, EDI software is required to be developed for translating the format used by one organization to the format being used by another organizations. So EDI is computer-to-computer communication using a standard data format to exchange business information electronically between independent organizations.

Working Principle of EDI – EDI is the electronic exchange of business documents such as invoices, purchase orders, shipping notices etc. EDI is a three step process :

1. First of all, sender data is converted into standard format as defined by EDI translation software.

2. Data in standard format is transferred to the receiver using communication lines.
3. Finally, standard format data is converted according to the format of receiver data base files.

EDI consists of three components:

- (i) **Communication** - To make EDI work, one needs communication software, translation software and access to standards. Communication software moves data from one point to another, flags the start and end of the document. Translation software helps the user to build a map and shows him how the data fields from his application corresponds to the elements of EDI standards. It also converts data back and forth between the application format and the EDI format.
- (ii) **Mapping** - To build a map, the user first selects the EDI standard for the kind of data he wants to transmit. Usually the trading partner tells about the kind of standards to be used. Next, he edits out parts of the standards, which do not apply, to his application. Next, he imports a file that defines the fields in his application, and finally he makes the map to show where the data required by the EDI standards is located in his application. Once the map is built, the translator will refer to it during EDI processing every time a transaction of that type is sent or received.
- (iii) **Profile** - The last step is to write a partner profile that tells the system where to send each transaction and how to handle errors or exceptions. Whereas the user needs a unique map for every kind of documents he exchanges with a partner, he should only have to define partner information once.

Q14. Explain the concept of communication protocols.

Answer 14.

Communication protocols are sets of rules or conventions that must be adhered to by both the communicating parties to ensure that the information being exchanged between them is received and interpreted correctly. A protocol defines the following three aspects of digital communication.

- (i) **Syntax** – The format of data being exchanged, character set used, type of error correction used, type of encoding scheme being used.
- (ii) **Semantics** – Type and order of messages used to ensure reliable and error-free information transfer.
- (iii) **Timing** – Define data rate selection and correct timing for various events during data transfer.

Communication protocols are defined in layers, the first of which is the physical layer or the manner in which node in a network are connected to one another. Both the network software and network-interface card have to adhere to a network protocol. The RS-232 C connector is the standard for some communication protocols. Subsequent layers, the number of which vary between protocols, describe how messages are packaged for transmission, how messages are routed through network, security procedures and the manner in which messages are displayed.

A number of different protocol codes are in use. For example, X.12 is the standard for electronic data interchange (EDI) X.75 is used for interconnection between networks of different countries, and XMODEM is used for uploading and downloading files. The set of most common protocols used on the Internet is called TCP/IP.

Q15. Which areas of DBMS should be addressed while maintaining a database? Explain.

Answer 15.

Following five areas of DBMS managements are be considered when trying to maintain a well-tuned database:

(i) Installation of database

- Correct installation of the DBMS product.
- Ensuring that adequate file space is available.
- Proper allocation of disc space for database.
- Allocation of data files in standard sizes for I/O balancing.

(ii) Memory Usage – One should know about following memory management issues:

- How the DBMS uses main memory ?
- What buffers are being used ?
- What needs the programs in main memory have?
- Knowledge of above issues can help in efficient usage of memory.

(iii) Input / Output (I/O) contention

- Achieving maximum I/O performance is one of the most important aspects of tuning. Understanding how data are accessed by end-users is critical to I/O contention.
- Simultaneous or separate use of input and / or output devices.
- Clock speed of CPU requires more time management of I/O.
- Spooling/Buffering etc. can be used.
- Knowledge of how many and how frequently data are accessed, concurrently used database objects need to be striped across disks to reduce I/O contention.

(iv) CPU Usage

- Multi programming and multi processing improve performance in query processing
- Monitoring CPU load.
- Mixture of online/back ground processing need to be adjusted.
- Mark jobs that can be processed in run off period to unload the machine during peak working hours.

Q. 16) Explain the terms:

i) Firewall

ii) Disaster Recovery

iii) Risk in information systems

Answer 16.

- (i) Firewalls offer an effective system to protect access by unauthorized user from outside. The main feature of firewall is packet-filtering router so that vital information does not pass to any unauthorized intruder, even if he manages get access to the network system. It is a

system of security in the network with the help of hardware and software. A software checks all incoming and outgoing internet traffics. The firewall routes the messages to a safe area to avoid any danger in the in forward transmission of messages. The screening by firewall software may delay the transmission process but ensures proper security.

Limitations of Firewall

- Passing on information by internal employees through internet can not be checked.
- Firewall can not protect the system from virus.

- (ii) **Disaster Recovery** : Disaster means sudden great misfortunate happening which can not be prevented. Disaster may be of two types – i) Natural like flood, earthquake, hurricane damage etc. ii) Technological like failure of computer, electrical fire etc.

The damage under disaster is generally enormous. The question of recovery in case of disaster comes from data. Data may be categorized as critical, vital, sensitive and non-critical. Recover plan may be devised accordingly to given priority of recovery of data of different importance.

Emergency Action : In the first stage the notification of damage is to be given to the appropriate agency/authority like fire service, police, insurance company etc. Then following action may be taken depending in the situation to save personnel, equipment, data etc like:

- sounding alarm bell
- use of fire extinguisher
- saving the back-up of software, data etc.

Recovery Action: There needs an advanced planning for recovery of data under disaster. Generally, the disaster recovery planning is done by a Recovery Committee and execution of recovery programmes is done under its supervision and control. These are:

- Backup Application software and backup of databases at a regular interval to be preserved in some other location.
- Mirror imaging of disk.
- Selection of alternative computer system.
- Restoration of application software and databases in the new computer system.
- Critical evaluation of performance of the application software.
- Assessment of loss of databases.
- Plan for recovery of data loss etc.

(iii) Risk is the probability of happening something adverse. An information is vulnerable to many risk factors which are categorized below.

Risk Management is a process of assessing risk and reducing it to an acceptable level. Steps involved in it are:

- Understanding the sources and causes of risk.
- Collection of data related to risk to analyse their nature and frequency.
- Evaluation of magnitude of risk.
- Develop policy to minimize the risk.
- Develop methodology to prevent their occurrence.
- Implementation of the methodology.

Q17. Define :

i) Audit Charter

ii) Audit Trail

iii) Outsourcing in Information System

Answer 17.

- i) There is a need for an audit charter for properly organising the information system audit function within an organisation. An audit charter covers legitimacy and role of the internal audit function inclusive of information system audit function and deals with three issues viz.
 - 1. Place of audit function within the organisation and its role in contributing towards fulfilment of organisational goals.
 - 2. Authority of the audit function to gain access to records, facilities and personnel including Board of Director's audit committee or to the Board itself.
 - 3. Responsibility of the audit function to advice the management about the quality of attainment of the four objectives viz. asset safeguarding, data integrity, system effectiveness and system efficiency.

The rights and responsibilities of both the internal audit function and the information systems audit function within an organisation should be clearly defined to prevent disputes over the issue and ensure effectiveness and efficiency of the audit function. It is also to be determined whether information system audit should have line function or staff function after considering the arguments for each strategy in the overall organisational perspective. Another issue concerns about centralisation as against decentralisation. This issue is to be dealt with also in the case of external auditors. Much depends on whether the organizational function is centralised or decentralised.

- ii) Audit trail refers to a system of designing of an information system in a manner that the historic data and information at any processing stage may be traced to verify the origin, correctness, authenticity, flow and destination including the stages of security procedures for establishment of integrity of data and information.
- iii) Outsourcing may be defined as the use of parties, external to the organisation, to provide goods or services to the organisation. Outsourcing in today's economic environment is considered as an important means of improving an organisation's competitiveness and profitability. By outsourcing an organisation can pay more attention to its core competitiveness and take advantage of other organisation's core competencies.

Any organisational function may be a point of consideration for outsourcing e.g. legal services, security, any manufacturing process, supply of components for the products, and even the information system itself.

The reasons for outsourcing of information system function are:

- 1. Exercising greater control over the information system function if it is outsourced e.g. vendors being more responsive to user needs, sharing economies of scale achieved by the vendor and restricted consumption of information system resources which are no longer free.
- 2. Innovative approach because of access to new technology and expertise expected from the vendor.

There is some preparatory work before a decision on outsourcing of information system services can be taken. Such work is of the following nature:

1. It should be determined what part of information system activities can be outsourced, what are strategic to the organisation, and whether suitable (expert, dependable, financially viable and reliable) vendors exist.
2. Terms and conditions of the contract including termination clause for outsourcing should be determined incorporating scope of work, audit rights, performance criteria, responsibilities etc.
3. Monitoring compliance with the terms and conditions.
4. Impact on the organisation.
5. Procedures for outsourcing disaster recovery control.