

OPERATION MANAGEMENT AND INFORMATION SYSTEM

OPERATION MANAGEMENT

OVERVIEW OF PRODUCTION PROCESS

Descriptive & Practical Questions :

- Q1. Draw the typical job description of a “Loader” in the dispatch section of a manufacturing organisation. [Ref: Q2. (a), Dec '08 / Paper-13]
- Q2. A tool manufacturing SSI unit requires about 900 nos. of HSS bars of size 2 cms square and 10 cms length in machined and annealed condition. The unit can get the input as above in two ways :
- Purchase unmachined HSS bars of standard size of 2.5 cms square and 10 cms length from market at a price of Rs. 60.00 per piece and then machine in its machine with shapers to size 2 cms square and 10 cm length and anneal it, further in its heat treatment shop. The annealing cost is Rs. 900 for a batch size upto 200 nos. maximum and if the batch size is smaller the same cost will be incurred. The HSS scrap produced after machined can be sold in scrap market at the rate of Rs. 4 per cubic cm.
 - The unit has got an offer from another firm for supply of machined and annealed HSS bars @ Rs. 115 per piece. Which alternative unit should adopt? [Ref: Q3. (a) (i)(ii), Dec '08 / Paper-13]
- Q3. APTECH Ltd. a ball bearing manufacturing Co. manufacturers three types of ball bearing M_X , B_A and B_N . During the year 2007-08, the total production of bearings were 10000, 12400 and 12000 nos. of M_X , B_A and B_N respectively. The standard Man-hours (SMH) for each type of ball bearing are 25, 20 and 12.5 respectively. In that year the company employed 900 workers (both piece workers and day — workers).
- The ratio of piece workers and day workers was 1:0.5. The company worked 50 weeks in the year 2007-2008 with 6 days of 5 hourly double shifts.
- Equal number of piece workers were deployed in each shift.
- Assuming on an average 10% absenteeism among the Industrial workers. What was the productivity of piece workers in the year 2007-08? [Ref: Q4. (b), Dec '08 / Paper-13]
- Q4. What do you understand by the term ‘Utilities’ in a factory? Briefly describe the different ‘Utilities’ required in a factory. [Ref: Q2. (a), June '08 / Paper-13]
- Q5. A Co. is engaged in manufacturing spark plugs for automobiles. The operations are performed on a CNC 3-axis drilling cum tapping centre. The operation cycle time is as follows :
- Drilling time : 45 secs; Tapping time : 90 secs; Tool change time : 25 secs.

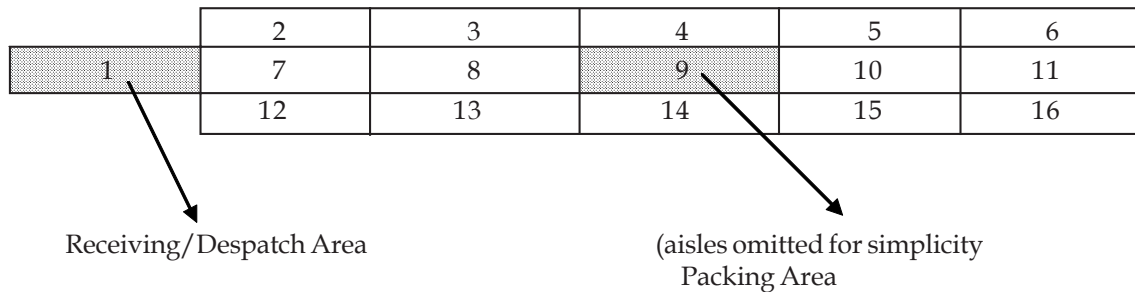
For feeding the spark plugs the Co. designed a fixture holding 10 spark plugs at a time and set up time for the 10 plugs in the fixture is 80 secs. The Co. decided to augment Capacity due to an additional order to the extent of 1.10 lakhs spark plugs per year. Assuming that manpower is no constraint, how many additional drilling tapping centres the Co. should procure under the augmentation plan?

Average rejection is 2% of the produced goods spark plugs.

Assume 300 working days per year of 8 hrs per day shift, 20% time, the drilling-tapping centers are not available due to preventive maintenance and the utilization is 70% of the available time due to power and service line shutdown.

[Ref: Q3. (b), June '08 / Paper-13]

Q6. The existing layout of a Finished Goods Stores in a manufacturing organization is as follows :



The other areas (2 to 8 and 10 to 16) are storage areas for different products.

Material flows between Area 9 and other 15 sections/areas. Loads are moved to Area 1 only from Area 9. All other loads flow from remaining areas/sections into Area 9. For simplicity, we consider only loads moved to Packing Area 9 from all areas, except the Receiving/Despatch Area 1. The location of Receiving/Despatch Area 1 is fixed and cannot be relocated. All other areas can be considered for relocation.

Average annual loads from each area/section to Area 9 are as follows :

Area	Load	Area	Load	Area	Load	Area	Load	Area	Load
2	500	5	150	8	350	12	150	15	250
3	100	6	150	10	250	13	250	16	500
4	350	7	150	11	100	14	100		

From Area 9 to Area 1, average annual loads are 2800. Using the Load Distance Matrix, arrive at an improved layout.

[Ref: Q2., Dec '07 / Paper-13]

Q7. Mention the factors that are normally covered in the choice of Appropriate Technology.

[Ref: Q2. (a), June '07 / Paper-13]

Q8. A factory has three departments X, Y, and Z to manufacture two products A and B. Department 'X' can produce parts for 7000 units of A or parts for 12000 units of B per week, but cannot do both at the same time, though parts for some A and for some B can be produced. Similarly Department 'Y' can produce 9000 parts for A or 6000 parts for B or combinations in between.

Financial assembly is undertaken in department 'Z' with separate assembly lines for A and B with maximum capacities by 6000 and 4000 units respectively. Both lines can be operated at the same time. What is the optimal Product Mix?

[Ref: Q3. (a), June '07 / Paper-13]

Q9. (a) Detail the steps involved in making a work-sampling study.

(b) HIPROD CO Ltd. manufactures three different items of tools. The time required to produce each tool on different operations is as given below :

Operations	Time in minutes		
	Drills	Cutters	Reamers
Turning	16	34	40
Grinding	10	8	17
Milling	4	5	8
Heat treating	3	3	3
Other data available :			
Sales per annum (units)	18000	20000	15000
Opening stock (units)	5000	6000	—
Closing stock (units)	2000	3000	4000

The workers are trained in each trade as such their services are not inter-changeable. They are paid at Rs. 11.00 per hour. The workers are paid for 2500 hours per annum which includes 200 hours for leave in which time substitute operators are appointed and for 300 hours the machines are taken for overhaul.

Using the above data, calculate :

- The production quantity ;
- No. of operators required per annum; and
- Annual direct labour cost on each type of tool. [Ref: Q5. (a), (b), June '07 / Paper-13]

Q10. Which material handling equipment are used in handling :

- Coal in a Thermal Power Plant ;
- Molten Steel in a Steel Plant ;
- For transporting finished components in a packed boxes from shops to stockyard ;
- Light Steel Sheets in a Shop ;
- Grading Moulding Sand in a Foundry. [Ref: Q2. (a), Dec. '06 / Paper-13]

Q11. State the measures normally used for defining capacity in the following products/ services :

Sl. no.	Product/Service	Measures of capacity
i	Steel Plant	
ii	Automobiles	
iii	Power Plant	
iv	Hospital	
v	Hotel	

[Ref: Q4. (a), Dec. '06 / Paper-13]

Q12. What material handling equipments you would choose for handling :

- (i) Iron scrap in a scrap yard.
- (ii) Red hot steel bullets in a rolling mill.
- (iii) Charging iron or in blast furnace.
- (iv) Handling heavy machine parts within small radial distance.
- (v) For movement of small components in a shop. [Ref: Q3. (a), Dec. '05 / Paper-13]

Q13. What are the measures commonly adopted to assess the effectivity of maintenance department?

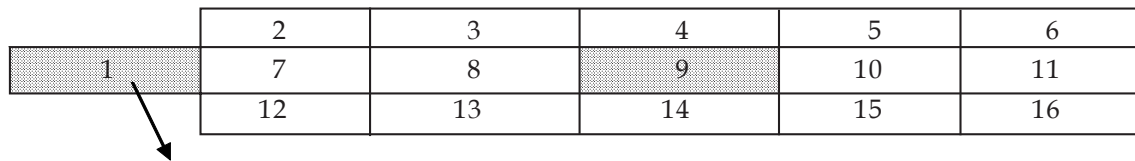
Which measure would you like to adopt in case of maintenance of CNC m/cs when there is a surplus capacity but the parts/components are very costly in nature?

[Ref: Q4. (a), Dec. '05 / Paper-13]

Q14. The Production Manager of a company is very much reluctant to initiate any action to improve Productivity during the recession in his industry.

Enumerate your views in the above context. [Ref: Q5. (a), Dec. '05 / Paper-13]

Q15. The existing layout of a Finished Goods Stores in a manufacturing organization is as follows :



Receiving/Despatch Area

Packing Area (aisles omitted for simplicity)

The other areas (2 to 8 and 10 to 16) are storage areas for different products.

Material flows between Area 9 and other sections/areas.

Loads are moved to Area 1 only from Area 9. All other loads flow from remaining areas/sections into Area 9.

For simplicity, we consider only loads moved to Packing Area 9 from all areas, except the Receiving/Despatch Area 1.

The location of Receiving/Despatch Area 1 is fixed and cannot be relocated. All other areas can be considered for relocation.

Average annual loads from each area/section to Area 9 are as follows :

Area	Load	Area	Load	Area	Load	Area	Load	Area	Load
2	500	5	150	8	350	12	150	15	250
3	100	6	150	10	250	13	250	16	500
4	350	7	150	11	100	14	100		

From Area 9 to Area 1, average annual loads are 2800.

Arrive at an improved layout using the "Load-Distance Matrix". [Ref: Q2. June '05 / Paper-13]

- Q16. (a) Briefly discuss different priority rules for a job shop for despatching.
- (b) On anticipating the current booming market, the Vajpayee Steels is planning to expand its capacity by adding more numbers of 10 ton capacity Electric Arc Furnace (EAF). Each batch of production (10 ton) involves 30 minutes furnace time including loading and unloading operations. Due to power restriction the furnace can be used only for 80% of the time. The required output for the capacity added is 160 ton per shift of 8 hours. The plant system efficiency is 50%.
- (i) Determine the number of furnaces required.
 - (ii) Estimate the percentage of idel time in furnace. [Ref: Q5. (a), (b), June '04 / Paper-13]

PRODUCTION PLANNING & PRODUCTIVITY MNGEMENT

Descriptive & Practical Questions :

Q1. The following tasks are to be performed on an assembly line in the sequences and times specified.

Task	Time (Seconds)	Tasks that must precede
A	50	—
B	40	—
C	20	A
D	45	C
E	20	C
F	25	D
G	10	E
H	35	B, F, G

- (i) Draw the schematic diagram.
- (ii) What is the theoretical minimum number of stations required to meet a forecast demand of 400 units per an 8-hour day?
- (iii) Use the longest task time rule and balance the line in mininum number of stations to produce 400 units per day.
- (iv) Evaluate the Line Efficiency and the Smoothness Index.

[Ref: Q2. (b), Dec. '08 / Paper-13]

Q2. Suggest certain measures to improve productivity in a small manufacturing unit for machining of small castings of same size and shape in a mass scale. [Ref: Q3. (a), Dec. '08 / Paper-13]

Q3. Discuss the locational factors to be considered while setting up a Industry.

[Ref: Q4. (a), Dec. '08 / Paper-13]

Q4. M/s ABC Ltd., makes four components, P, Q, R and S for which costs in the forthcoming year are expected to be as follows :

	P	Q	R	S
Production (unit)	1000	2000	4000	3000
Unit marginal costs :	Rs.	Rs.	Rs.	Rs.
Direct Material	4	5	2	4
Direct Labour	8	9	4	6
Variable Prodn. Overhead	2	3	1	2
	<u>14</u>	<u>17</u>	<u>7</u>	<u>12</u>

Directly attributable fixed cost per annum and committed fixed costs are as follows :

	Rs.
Incurred as a direct consequence of making P	1,000
Incurred as a direct consequence of making Q	5,000
Incurred as a direct consequence of making R	6,000
Incurred as a direct consequence of making S	8,000
Other fixed cost committed	30,000
	<u>50,000</u>

[Ref: Q2. (b), June '08 / Paper-13]

Q5. Draw a comparison between 'Type grouping' and 'Sequence grouping' in a factory.

[Ref: Q3. (a), June '08 / Paper-13]

Q6. (a) What are the 'Chance Causes' and 'Assignable Causes'? What are their significance in SQC?

(b) Discuss briefly regarding the salient features of a 100% Inspection and Sampling Inspection.

(c) What is 'Delphi' technique? What is its applicability in a manufacturing organization?

[Ref: Q4. June '08 / Paper-13]

Q7. Vision Graphics provides copy services for law firms in Mumbai suburbs.

Five customers submitted their orders at the beginning of the week. Specific scheduling data are as follows :

Job in order of arrival	Processing Time (days)	Due date (days hence)
A	3	5
B	4	6
C	2	7
D	6	9
E	1	2

(i) FCFS (First Come First Served)

(ii) SOT (Shortest Operation Time)

(iii) D Date (Due Date)

(iv) STR (Slack Time Remaining)

(v) LCFS (Last Come First Served)

[Ref: Q3. Dec. '07 / Paper-13]

Compute the Mean Flow Time and Average Lateness using the Five Priority Rules and determine the best Priority Rule to sequence the jobs.

Q8. What is Work Sampling? What is its scope and applicability?

[Ref: Q4. (a) Dec. '07 / Paper-13]

Q9. Mention the factors that are normally covered in the choice of Appropriate Technology.

[Ref: Q2. (a) June '07 / Paper-13]

Q10. A radial bearing manufacturing unit produces three types of bearings namely X, Y and Z. During the year 2006-2007, the unit manufactured 20000; 10000 and 13650 Nos. of X, Y and Z respectively. The standard Man-hours (SMH) of X, Y and Z are 12, 14 and 16 respectively. The unit worked for 8 hours per day for single shift for Monday to Friday and 4 hours shift on Saturday. There were 50 working weeks during the year. The ratio of piece workers to Day workers among Industrial employees was 1:0.4 and total No. of Industrial employees were 560. Assuming on an average 15% absenteeism among Industrial employees, what was the productivity of piece workers during the year 2006-2007? [Ref: Q3. (b) June '07 / Paper-13]

Q11. (a) What are the objectives of using Control Charts for Variables?

[Ref: Q4. (a), June '07 / Paper-13]

(b) 20 samples were obtained from the fabric being produced by a weaving machine. The number of defects per 100 metres of cloth for the samples is given below :

15	13	14	12	17	14	13	16	16	15
12	13	13	12	15	14	14	17	16	15

(i) Determine the Control Chart limits for the machine;

(ii) On a particular day, when the machine is operating under controlled conditions, 10 samples were drawn and the defects per 100 metres of cloth are as follows :

11	18	27	12	13	8	2	15	19	20
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What conclusions would you draw from these observations?

[Ref: Q4. (b), June '07 / Paper-13]

Q12. What are the important factors considered in deciding dispatching rules in case of job shop scheduling?

[Ref: Q3. (a), Dec. '06 / Paper-13]

Q13. A company is engaged in drilling and tapping of spark plugs to an automobile co. The corporations are performed on a CNC 3-Axis drilling and tapping center.

The CNC Cycle time is as follows :

Drilling Time	: 45 seconds.
Total tapping Time	: 1 minute 30 seconds.
ATC tool changing Time	: 25 seconds.

For feeding the spark plugs the company designed a special fixture holding 10 plugs at a time and set up time by the operator for the 10 plugs is 1 minutes 20 seconds.

The machine cycle time shown above includes the movement time of each spark plug also.

The company has decided to augment capacity due to an additional order from the automobile co. to the extent of 1.10 lakhs spark plugs per year.

Assuming that manpower is no constraint, how many additional drilling-tapping centers the company should procure under the Augmentation Plan?

Average rejection % is 2% of the produced spark plugs in drilling-tapping centers.

Assume 300 working days /year of 8 hrs. per day.

Please note that 20% time the drilling and tapping centers are not available due to preventive maintenance and the utilization is 70% of the available time due to power and service line shut downs.

[Ref: Q3. (b), Dec. '06 / Paper-13]

Q14. List several ways that a firm can respond to meet seasonal demand patterns.

[Ref: Q4. (b), Dec. '06 / Paper-13]

Q15. A firm must produce 40 units/ day during and 8-hours work day.

Tasks, times and predecessors are given below :

Tasks Time (minute) Predecessor(s)

Task	Time (Seconds)	Predecessors(s)
A	2	—
B	2	A
C	8	—
D	6	C
E	3	B
F	10	D, E
G	4	F
H	3	G

Find out

(i) the cycle time,

(ii) no of theoretical work stations.

[Ref: Q4. (c), Dec. '06 / Paper-13]

Q16. Draw a comparison between “Type Grouping” and “Sequence Grouping” of machines in a factory.

[Ref: Q3. (a), June '06 / Paper-13]

Q17. What are the advantages of “Diversification”?

[Ref: Q2. (a), June '06 / Paper-13]

Q18. Should the following industries “Simplify” or “Diversify” and why?

(i) Automobile.

(ii) Cosmetic.

[Ref: Q2. (b), June '06 / Paper-13]

Q19. A Media Company proposes to build a new office in one of the three locations. Using the data below, determine the best location. Please assume the following values :

Excellent = 10, V. Good = 8, Good = 6, Fair = 4 and Poor = 2.

Rating Factor	Location	Location 1	Location 2	Weight 3
A. Living Standard	Excellent	Good	Fair	30
B. Labour Relations	Good	Fiar	Excellent q	10
C. Govt. aid	V. Good	Good	Poor	5
D. Schooling System	Fair	Excellent	Good	15
E. Distance to Customers	V. Good	Poor	Excellent	10
F. Distance to Suppliers	Poor	Good	V. Good	10
G. Revenue Contribution	V. Good	Excellent	Good	20

[Ref: Q4. (a), June '06 / Paper-13]

Q20. Vision Graphis provides copy services for law firms in Mumbai suburbs. Five customers Submitted their orders at the beginning of the week. Specific scheduling data are as follows :

Job (In order of arrival)	Processing Time (Days)	Due Date (Days hence)
A	3	5
B	4	6
C	2	7
D	6	9
E	1	2

All orders require the use of the only colour copy machine available.

Vision Graphics would like to use the following Priority Rules and decide the best rule for the Job Sequencing, using the evaluation criterion of minimum flow time :

- (i) FCFS (First Come First Served)
- (ii) SOT (Shortest Operation Time)
- (iii) D Date (Due Date)
- (iv) STR (Slack Time Remaining)
- (v) LCFS (Last Come First Served)

Compute the Mean Flow Time and the Average Lateness using the five Priority Rules and determine the best Priority Rule to sequence the jobs. [Ref: Q2., Dec. '05 / Paper-13]

Q21. A company orders its stock twice in a year, the order quantity each time being one half of the year's forecast of demand. The new Materials Manager, however, wants to change this practice and wishes to introduce professions materials management practices like EOQ and orders to be released based on Recorder Levels.

For an inventory item, "X", the following data is available :

Forecast of Annual Demand : 500 Units
Procurement Cost/Unit : Rs. 12

Cost of Placing an Order : Rs. 5
 Lead Time for Procurement : 4 weeks
 Stockholding Cost : 20% of average stock value

The Materials Mnager wants to maintain a safety stock of 15 units to cater to demand fluctuations and to ward off stock-outs. If the new Materials Manager has his way.

Calculate for item "X" :

- (i) Recorder Level;
- (ii) Expected reduction in average stock value; and
- (iii) Anticipated reduction in inventory costs in the first year and in subsequent years.

[Ref: Q4. (b), Dec. '05 / Paper-13]

Q22. Explain the Point Rating System of Job Evaluation with the help of an attribute-degree table.

[Ref: Q3. (a), Dec. '05 / Paper-13]

Q23. Discuss the four important stages involved in the development of a new product in a manufacturing industry.

[Ref: Q2. (a), Dec. '04 / Paper-13]

Q24. Swastika Limited manufactures four automobile components A, B, C and D . The basic cost information regarding the components is as follows :

	A	B	C	D
(i) Production volume (Nos.) per annum	2,500	5,000	10,000	7,500
(ii) Direct Fixed Costs per annum (Rs.)	2,500	12,500	15,000	20,000
(iii) Variable coss per unit :				
Direct Material (Rs.)	6	5	3	5
Direct labour (Rs.)	7	8	5	7
Production Overheads (Rs.)	3	4	2	3

Aubcontractor offered to supply the four components A, B, C & D @ Rs. 14, Rs. 21, Rs. 13 and Rs. 17 per unit respectively.

Should Swastika make of buy these components? [Ref: Q2. (b), Dec. '04 / Paper-13]

Q25. What are the objectives of using control charts for vaiables? [Ref: Q3. (a), Dec. '04 / Paper-13]

Q26. 20 Samples were obtained from the fabric being produced by a weaving machine. The number of defects per 100 metres of cloth for the samples is given below :

15 13 14 12 17 14 13 16 16 15
 12 13 13 12 15 14 14 17 16 15

- (i) Determine the Control Chart limits for the machine;

- (ii) On a particular day, when the machine is operating under controlled conditions, 10 samples were drawn and the defects per 100 metres of cloth are as follows :

11 18 27 12 13 8 2 15 19 20

What conclusions would you draw from these observations?

[Ref: Q3. (b), Dec. '04 / Paper-13]

- Q27. What is Value Analysis? Explain the main phases of activities in Value Analysis. What are the result accelerators which would help identify avoidable costs and facilitate to evolve value alternatives?

[Ref: Q4. (a), Dec. '04 / Paper-13]

MAINTENANCE MNGEMENT

Descriptive & Practical Questions :

- Q1. A brass washer manufacturing unit produces one type of Washer A using one Lathe and one radian drilling machine. Both the machine tools work one shift of 8 hours per day and 25 days in a month. Preventive Maintenance time for both the machine tools is 1 hour each every day and the machine tools run 80% of available time due to service line and system constraints. The machining time per washer is 0.40 minutes and 0.30 minutes for lathe and radial drilling respectively. The selling price varies with volume as follows :

Volume in unit per month	Selling price per unit (Rs.)
(i) Upto 10,000	9.00
(ii) 10,000 to 16,000	8.50
(iii) 16,000 to 18,000	8.00
(iv) Above 18,000	7.50

Fixed cost is Rs. 80,000 per month upto 12,000 units and Rs. 86,000 per month beyond 12,000 units and Rs. 90,000 per month beyond 16,000. Variable cost per unit is Rs. 1.50. Find out the production volume at which profit is maximum and calculate the same.

[Ref: Q4. (b), Dec. '07 / Paper-13]

- Q2. A crane wheel assembly is made of cast steel wheel and two gun metal bushes. Find the cost of the assembly assuming no special toolings are required and using the details given below :

	Cast Wheel	Gun Metal Bush
(i) Weight of each raw casting	25 Kg.	3 Kg.
(ii) Material Cost/Kg.	20 Rs.	60 Rs.
(iii) Sale Price of Scrap/Kg.	4 Rs.	40 Rs.
(iv) Finished weight/unit after machining	20 Kg.	2 Kg.
(v) Machine hours required per unit :		
a. Boring M/c	6 hrs.	—
b. Lathe	—	1.5 hrs.

Machine Hour Rates are Rs. 40/hour for Boring

Machine Hour Rates are Rs. 20/hour for Turning.

Assembly takes $\frac{1}{2}$ Hr, costs Rs. 10/hour and consumes hardware worth Rs. 5.

[Ref: Q4. (b), June '06 / Paper-13]

- Q3. What are the measures commonly adopted to assess the effectivity of maintenance department? Which measure would you like to adopt in case of maintenance of CNC m/cs when there is a surplus capacity but the parts/components are very costly in nature?

[Ref: Q4. (a), Dec. '05 / Paper-13]

Q4. The Production Manager of a company is very much reluctant to initiate any action to improve Productivity during the recession in his industry. Enumerate your views in the above context.
[Ref: Q5. (a), Dec. '05 / Paper-13]

Q5. Under what circumstances is a dynamic concept and an ever on-going activity.
[Ref: Q5. (b), Dec. '05 / Paper-13]

Q6. An automobile component gets processed on a number of machines for which the standard times and the machine utilization factors are given below.
Find the Capacity in the set-up per day, considering two 8-hour shifts per day and the average efficiency of the workmen being (i) 100% and (ii) 80%.

Machine	Standard Time in Minutes	M/c Utilisation Factor
(i) Sawing	3.00	0.80
(ii) Facing & Centering	2.50	0.80
(iii) Lathe	4.00	0.75
(iv) Milling	5.00	0.80
(v) Drilling	6.00	0.90

[Ref: Q4. (b), Dec. '04 / Paper-13]

Q7. "Three" Limited is a popular manufacturer of different kind of lifting tools. These lifting tools are made of polypropylene fibre. The company installed a plant for backward integration of its raw material polypropylene fibre. It produces these polypropylene fibre at the rate of 5000 mt per hour. The usage rate of these fibre for the production of lifting tool is 20000 mt per day considering 8 hours working per day. The cost of fibre is Rs. 5 per metre. The inventory carrying cost is 25% and the set up cost are Rs. 4050 per set up. Compute optimal number of cycle required in a year for the manufacture of this special fibre. (Take 365 days as no. of days for the year in your computations).
[Ref: Q2. (b), June '04 / Paper-13]

RESOURCE MANAGEMENT

Descriptive & Practical Questions :

Q1. The packing section in a detergent factory operates under the guaranteed piece rate system of wage payment. The piece rate per cake packed is 25 paise. The guaranteed wage per day (of 480 minutes) is Rs. 40. On a typical day, the number of cakes packed by each of the four workers P, Q, R & S in the packing department is as follows :

P-400; Q-300; R-180; and S-150.

- What are the earnings of each worker on this day?
- What is the average labour cost of packing on this day?

- (iii) What is the labour productivity of each worker if the standard time for packing each cake is one minute? [Ref: Q2. (b), Dec. '06 / Paper-13]
- Q2. A company has sales of Rs. 100 lakhs of which 70% represents variable costs. Fixed costs are Rs. 20 lakhs.
- If sales are now increased by 10%, what will be the improvement in profit?
- On the other hand, if due to improved productivity, variable costs are decreased by 10%, what will be the profit?
- Compare the present profit with those under the cases as cited above.
- What is your recommendation? [Ref: Q5. (b), June '06 / Paper-13]

- Q3. A manufacturing organization operates an incentive scheme on slab rates based on cost of production as shown below :

Saving in production cost (Labour + Material + Overheads)	Incentive Amount (as % of savings)
1 – 10%	5%
11 – 20%	15%
21 – 40%	30%
41 – 70%	40%
Above 70%	50%

Three workers X, Y, and Z take 25 hours, 30 hours and 15 hours respectively to produce 10 units of the product and their respective wage rates are Rs. 6, Rs. 6.50 and Rs. 7 per hour. The material costs Rs. 50 per unit and the overhead recovery rate is @ 500% of cost of wages. The standard cost of production per unit is determined as Rs. 175 per unit.

What is the amount of incentive earned by each of these workers and what is the actual cost of production per unit in each case? [Ref: Q4. (b), June '05 / Paper-13]

- Q4. An automobile ancillary unit manufactures and supplies three types of radiator brass caps A, B and C to an automobile manufacturer. During the year 2004-05 the unit produced 30,000; 45,000 and 30,000 of A, B and C respectively. Unit SMH of A, B and C are 3, 4 and 4.5 respectively. The unit engaged 300 Industrial employees during the year and the ratio of Direct Labour to Indirect Labour to was 1:0.5. The unit worked 8 hrs shift per day for 6 working days in a week and there were 50 weeks working during the year. Assuming on an average 10% absenteeism among employees. What was the productivity of direct labour during the year? [Ref: Q3. (b), Dec. '05 / Paper-13]

- Q5. Learning curve. [Ref: Q5. (b), Dec. '04 / Paper-13]

- Q6. A farmer has a 100 acre farm. He can sell all the tomatoes, lettuce or radishes he can raise. The price he can obtain is Rs. 2/kg for radishes. The average yield per acre is 2,000 kgs of tomatoes, 3,000 heads of lettuce and 1,000 kgs or radishes. Fertilizer is available at Re. 1/kg and the

quantity required per acre is 100 kgs each for tomatoes and lettuce and 50 kgs for radishes. Labour required for sowing, cultivating and harvesting per acre is 5 man-days each for tomatoes and radishes and 6 man-days for lettuce. A total of 400 man-days of labour are available at Rs. 40 per man-day. [Ref: Q2. (b), June '04 / Paper-13]

- Q7. In a factory three products A, B and C are produced. There is the possibility of applying two strategies — produce all the three items or any two of them. Products A and C pass through shops I and II, whereas B is further processed in shop III. Each has limited available hours. Hours available in shops I, II and III are 162 hours, 189 hours and 5 hours respectively. Profit per unit of A, B and C is Rs. 27, Rs. 29 and Rs. 25 respectively.

The following table gives the processing time of different items in different shops :

Shops	Items		
	A	B	C
I	27	12	12
II	27	15	25
III	0	3	0

Formulate the problem as a linear programming model to maximize total profit. You are not required to solve the problem. [Ref: Q4. (c), Dec. '04 / Paper-9]

- Q8. S Ltd. has been operating a new manufacturing process for about five months and the manager estimates that there is a 90% chance that the process currently operating is in an in-control state. The process is such that if it is in an in-control or an out of control state, it will not change without some form of intervention.

If the process is investigated, the cost of the investigation is estimated to be Rs. 2,0000 and if a correction is necessary, the cost of correction will be an additional Rs. 1,000. If the process is allowed to operate in an out-of-control state, the incremental cost is expected to be Rs. 11,000 over the planning horizon.

Calculate the probability of the process being out-of-control that would make management indifferent between investigating and not investigating the process. Calculating the expected cost of each action. [Ref: Q7. (b), Dec. '04 / Paper-9]

- Q9. A department head has four subordinates and four tasks have to be performed. Subordinates differ in efficiency and tasks differ in their intrinsic difficulty. Time each man would take to perform each task is given in the effectiveness matrix. How the task would be allotted to each person so as to minimize the total man-hours?

Subordinate

	I	II	III	IV
A	8	26	17	11
B	13	28	4	26
C	38	19	18	15
D	19	26	24	10

[Ref: Q6. June '05 / Paper-13]

Q10. For a company engaged in the manufacture of three products A, B and C, the available data is given below :

Table-1

Product	Minimum sales requirement per month
A	20
B	40
C	60

Table-2

Operation	Hrs. required per item of			Total available hours per month
	A	B	C	
1	2	4	4	800
2	4	2	2	880
3	6	2	4	720

Table-3

Product	Profit per unit (Rs.)
A	20
B	30
C	16

To find out the product mix and to maximize profit, formulate the problem as a Linear Programming model.

[Ref: Q7. (a), Dec. '05 / Paper-13]

- Q11. A manufacturing Company produces three types of equipments, W1, W2 and W3. All the types of equipments are first required machining work followed by assembly. The time required for the three types of equipments are as under :

Type of equipment	Machine time (in hrs.)	Assembly time (in hrs.)
W1	15	4.4
W2	13	3.5
W3	12	4.0

The total available machine and assembly time are, respectively, 4000 and 1240 hours per month. The data relating to selling price and costs for the three are :

	W1	W2	W3
Selling price (Rs.	11,000	5,000	3,000
Labour, material and other variable expenses	8,000	2,4000	1,500

Total cash available after meeting all expenses is Rs. 1,30,00.

You are required to put the problem in a linear programming model to maximize profit.

[Ref: Q7. (b), June '06 / Paper-13]

- Q12. An animal feed company must produce 200 Kg. of a mixture consisting of ingredients X and Y daily. X costs Rs. 3 per Kg. and Y Rs. 8 per Kg. No more than 80 Kgs. of X can be used and at least 60 Kgs. of Y must be used. Formulate the problem as a Linear Programming Model.

[Ref: Q5. (a), Dec. '06 / Paper-13]

- Q13. OPTIMAX MUTUAL FUND Company has Rs. 30 lakhs available for investment in Government bonds, Blue chip stocks, Speculative stocks and Short term deposits. The annual expected return and risk factor are given below :

Type of Investment	Annual Expected Return (%)	Risk Factor (0 to 100)
Government bonds	12	12
Blue-chip socks	20	24
Speculative stocks	24	48
Short term deposits	10	6

Mutual Fund is required to keep at least Rs. 4 lakhs in short term deposits and not to exceed average risk factor of 42. Speculative stocks must be at most 20% of the total amount invested.

How should OPTIMAX MUTUAL FUND Company invest the funds so as to maximize its total expected annual return? Formulate this as a Linear Programming Problem. You are not required to solve the LPP.

[Ref: Q2. (b), June '07 / Paper-13]

- Q14. The following Table shows all the necessary information on the availability of supply to each factory of Agro Industries Ltd., the requirement of each destination and the unit transport cost (in Rs.) from each factory to each destination :

Destinatiuon				
Factory	I	II	III	Supply
A	5	1	7	10
B	6	4	6	80
C	3	2	5	15
Demand	75	20	50	

Since there is not enough supply, some of the demands at three destinations may not be satisfied. For the unsatisfied demands, penalty costs be Re. 1, Rs. 2 and Rs. 3 respectively.

Find the optimal allocation that minimize the transportation and penalty costs by using Vogel's Approximation Method (VAM). [Ref: Q3. (a), June '07 / Paper-13]

- Q15. Four products A, B C and D have Rs. 5, Rs. 7, Rs. 3 and Rs. 9 profitability respectively. First type of materials (limited supply of 8090 kg) is required by A, B, C and D at 4 kg., 3 kg., 8 kg. and 2 kg., respectively per unit. Second type of material has a limited supply of 300 kg, and is for A, B, C and D at 1 kg., 2 kg., 0 kg. and 1 kg. per unit. Supply of other types of materials consumed is unlimited. Machine hours available are 500 hours and requirements are 8, 5, 0 and 4 hours for A, B, C and D each per unit. Labour hours are limited to 900 hours and requirements are 3, 2, 1 and 5 hours for A, B, C and D respectively.

How should a firm approach so as to maximize it profitability? Formulate this as Linear Programming Problem. You are not required to solve the LPP.

[Ref: Q3. (a), Dec. '07 / Paper-13]

- Q16. The following table shows all necessary information on the supply to three warehouses D, E and F of three factories X, Y and Z of Avon Ltd., The weekly supplies of the factorires and warehouses demands are as under :

Factory supplies :

X-50 units ; Y-40 units ; Z-60 units

Warehouse demand :

D-20 units ; E-95 units ; F-35 units

Using the cost information in the table below, compoute the optimal transportation cost using the MODI method.

Factory/Warehouse	D	E	F
X	6	4	1
Y	3	8	7
Z	4	4	2

[Ref: Q5. (a), June '08 / Paper-13]

Q17. NBA Promotion Bank is trying to select investment portfolio for a cotton farmer. The Bank has chosen a set of four investment alternatives with subjective estimates of rates of returns and risk as given below :

Investment	Annual rate of return (ARR)	Risk
Tax-free Municipal Bonds	6.0	1.3
Corporate Bonds	8.0	1.5
Mutual Funds	7.0	1.7
Real Estates	15.0	2.7

The bank officer in charge of the portfolio would like to maximize the average ARR on the portfolio. However, the investor has specified that the average risk of the portfolio should not exceed 2.0 and does not want more than 20% of the investment to be put into Real Estates. Formulate this as a Linear Programming Problem. You are not required to solve the LPP problem. [Ref: Q5. (b), June '08 / Paper-13]

Q18. What are the practical applications of Linear Programming?

[Ref: Q5. (a), Dec. '08 / Paper-13]

Q19. A cereal manufacturer is investigating the possibility of introducing a new cereal. It would be composed of wheat, rice and corn flakes. Requirements are given below :

Cost per ounce and dietary requirements for diet problems

	Wheat	Rice	Corn	Requirements (Per 12 ounce box)
Protein (gms per ounce)	4	2	2	at least 27gms
Carbohydrates (gms per ounce)	20	25	21	at least 240 gms
Calories per ounce	90	110	100	not more than 1260 calories
Cost (Rs. '000)	.03	.05	.02	

Make out a Linear programming model that will determine the optimum quantities of wheat, rice and corn per box that will achieve the requirements at minimum cost. (Work out only the formulation – solution not required.) [Ref: Q5. (b), Dec. '08 / Paper-13]

INFORMATION SYSTEM ANALYSIS AND DESIGN**Descriptive & Practical Questions :**

Q1. Write short notes on :

- (a) Contingency Planning ;
- (b) Virtual Reality ;
- (c) Integrated Circuits ;
- (d) Hash Function.

[Ref: Q4., June '04 / Paper-13]

Q2. "In a computerised environment, a source document should be carefully designed for prevention and detection of errors at all stages of processing and gaining confidence of audit team when referenced back as original source."

What are the measures to be adopted to minimise error possibilities while designing a source document?

[Ref: Q6. (b), June '04 / Paper-13]

Q3. Name the different stages in the Systems Development Life Cycle. What is Changeover and what are the methods that are followed ?

[Ref: Q8. (a), June '05 / Paper-13]

Q4. Describe the significance of benchmarks. What are the three categories of Controls?

[Ref: Q8. (b), June '04 / Paper-13]

Q5. (a) You have been engaged as Management Consultant for the computerization plant undertaken by a large car manufacturing company. Before assessing the information needs, you have been requested to identify at least three major activities under each of the following functions of the company :

- (i) Manufacturing,
- (ii) Marketing and
- (iii) Finance & Accounting.

[Ref: Q4. (a), June '06 / Paper-13]

Q6. Explain briefly "system" and its characteristics. What do you understand by integration of systems?

[Ref: Q5. (c), Dec. '06 / Paper-13]

Q7. "While computerization has an array of advantages, it also exposes the company to a number of hazards." Name some of these hazards and some measures to avoid them.

[Ref: Q7. (c), Dec. '06 / Paper-13]

Q8. What are the features of a good source document design? What safeguards should be taken before making changes to source documents?

[Ref: Q8. (c), Dec. '06 / Paper-13]

Q9. What are the main objectives of MIS?

[Ref: Q8. (b), June '07 / Paper-13]

Q10. What is system testing and what do we test in this testing? [Ref: Q7. (a), Dec. '07 / Paper-13]

Q11. What do you mean by system analyst? What are the multifaceted roles of a system analyst?

[Ref: Q7. (b), Dec. '06 / Paper-13]

Q12. What is parity bit? Why is it used?

[Ref: Q2. (a), June '08 / Paper-13]

Q13. What is meant by 'cording'? What are the characteristics of a good coding system?

[Ref: Q6. (b), June '08 / Paper-13]

Q14. What is Parity checking? Convert the digit 9 into its EBCDIC representation and add a suitable parity bit so that it conforms to the odd parity convention of EBCDIC.

[Ref: Q7. (b), June '08 / Paper-13]

DATABASE MANAGEMENT SYSTEM**Descriptive & Practical Questions :**

Q1. "There can be many specialists in a database environment." Name at least four such specialists and the duties of any two of them who may be considered essential.

[Ref: Q2. (a), June '04 / Paper-13]

Q2. Distinguish between DBMS centralised architecture and client-server architecture.

[Ref: Q2. (b), June '04 / Paper-13]

Q3. With respect to Data Base management System, write short on the following :

- (i) Query Languages
- (ii) De-normalization
- (iii) Normalization
- (iv) Data Redundancy

[Ref: Q6., Dec. '04 / Paper-13]

Q4. Explain DBA and its role. Why is DBA essential?

[Ref: Q6. (b), Dec. '04 / Paper-13]

Q5. What is a DBMS? What is a primary key and what are its constraints? Name a commonly used DBMS.

[Ref: Q7. (a), June '05 / Paper-13]

Q5. What is database? Briefly describe the characteristics of the database.

[Ref: Q3. (a), Dec. '05 / Paper-13]

Q6. What is DBMS? Mention any six advantages of the DBMS. [Ref: Q3. (b), Dec. '05 / Paper-13]

Q7. What is a DBMS? What is meant by defining, constructing and manipulating a DBMS?

[Ref: Q7. (b), June '06 / Paper-13]

Q8. Describe the functionality of a Client Server architecture. Where is it appropriate?

[Ref: Q4. (a), Dec. '06 / Paper-13]

Q9. What is meant by RDBMS? Name two commonly used RDBMS.

[Ref: Q6. (a), Dec. '06 / Paper-13]

Q10. What are the responsibilities discharged and the nature of problems during implementation phase handle by a System Analyst in a database environment?

[Ref: Q6. (b), Dec. '06 / Paper-13]

Q11. What are the responsibilities discharged by a System Analyst in a database environment? Why is the database administrator (DBA) essential?

[Ref: Q6. (a), June '07 / Paper-13]

- Q12. Describe the salient features of the hierarchical database. [Ref: Q6. (b), Dec. '07 / Paper-13]
- Q13. Who is a Database Administrator and what is his role? [Ref: Q4. (b), June '08 / Paper-13]
- Q14. What are objectives of a database? [Ref: Q7. (c), June '08 / Paper-13]

ENTERPRISE RESOURCE PLANNING

Descriptive & Practical Questions :

- Q1. "It is better to depend on reputed ERP software packages than to develop such packages internally."
(i) Do you agree with the above opinion? Furnish the reasons in support of your decision.
(ii) On implementation of ERP, what will be the changes in the information processing system? [Ref: Q6. (a), June '04 / Paper-13]
- Q2. "In the current turbulent scenario, organizations are confronted with a range of problems that never existed before. These are cash flow, supply chain, new markets, competition and increasing customer expectations where ERP cannot really help much."
[Ref: Q4. (a), June '05 / Paper-13]
- Q3. Explain briefly the operation by an office automation system. Why is it required?
[Ref: Q4. (b), Dec. '05 / Paper-13]
- Q4. Give the name of any four popular ERP packages. Do we need a database platform for ERP? If so which one? [Ref: Q6. (a), June '06 / Paper-13]
- Q5. What is automated office? List down the components of the automated office and their major functions. [Ref: Q5. (b), Dec. '06 / Paper-13]
- Q6. (a) "ERP supports achievement of business plan and strategies." — Mention some of the benefits that may be derived by implementing ERP. Can ERP be assumed to be an automated system?
[Ref: Q4. (a), June '07 / Paper-13]
- Q7. What are the characteristics and features of an ERP? [Ref: Q7. (c), Dec. '07 / Paper-13]