

Day : Friday
Date : 23/11/2018

W-2018-2578

Time: 02.30 PM TO 05.30 PM
Max. Marks: 60

N. B. :

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable calculator is **ALLOWED**.
- 4) Assume suitable data, if necessary.

Q. 1 a) Define Operation Research. Describe various phases of operation research. **(05)**

b) A company manufactures two products A and B. Both products pass through three departments of the plant. The production rate per shift (8 hours) for each product and available hours per month of each department are given below: **(05)**

Product	Department		
	1	2	3
	Production rate per shift		
A	2	4/3	4
B	4/3	2	4
Available hours per month	1200	1800	800

The marketing department requires that at least 200 units of product A and 250 units of product B must be made available per month. The unit contributions of the two products are Rs. 120 and Rs. 140 respectively. Formulate the problem as a linear programming model.

OR

Solve the following Linear programming problem by Simplex method: **(10)**

$$\begin{aligned}
 \text{Max} \quad & Z = x_1 - x_2 + 3x_3 \\
 \text{subject to} \quad & x_1 + x_2 + x_3 \leq 10 \\
 & 2x_1 - x_3 \leq 2 \\
 & 2x_1 - 2x_2 + 3x_3 \leq 0 \\
 \text{and} \quad & x_1, x_2, x_3 \geq 0
 \end{aligned}$$

Q. 2 Describe the Hungarian method and solve the following problem for minimization. **(10)**

The following table indicates the number of absentees lecturewise and daywise. Schedule these lectures in such a way as to minimize the total number of students forced to remain absent.

	1	2	3	4	5
Mon.	3	2	3	9	10
Tues.	11	5	9	10	2
Wed.	1	3	8	2	4
Thur.	8	11	10	5	2
Fri.	8	6	5	6	9

P. T. O.

OR

Find the initial basic feasible solution of the following problem. Also find the optimum solution. (10)

	D1	D2	D3	D4	Supply
O1	23	27	16	18	30
O2	12	17	20	51	40
O3	22	28	12	32	53
Demand	22	35	25	41	123

Q. 3 a) Describe inventory control model with one price break. (05)

b) A manufacturer has to supply his customer 24,000 units of his product per year. This demand is fixed and known. The customer has no storage space and so the manufacturer has to ship a day's supply each day. If the manufacturer fails to supply, the penalty is Rs. 0.20 per unit per month. The inventory holding cost amounts to Rs. 0.10 per unit per month and set up cost is Rs. 350 per production run. Find the optimum lot size for the manufacturer. (05)

OR

a) What are the various costs associated with inventory? (03)

b) The demand of a product is 10,000 units. Each unit costs Rs. 100 if the orders are placed in quantities below 200 units. For orders of 200 or above, however the price is Rs. 95. The annual inventory holding costs is 10 % of the value of the item and the ordering cost is Rs. 5 per order. Find the economic lot size. (07)

Q. 4 Given the following data: (10)

Job	1	2	3	4	5	6
m/c A	12	10	9	14	7	9
m/c B	6	5	6	4	2	4
m/c C	7	6	6	5	4	4

Sequence suggested: 5-3-6-2-1-4

- i) Determine the total elapsed time for the sequence suggested.
- ii) Is the given sequence optimal?
- iii) If your answer to (ii) is 'No', determine the optimal sequence and the total elapsed time associated with it.

OR

A typist at an office receives, on the average 22 letters per day for typing. The typist works for 8 hrs a day and it takes on the average 20 minutes to type a letter. The company has determined that the cost of a letter waiting to be mailed is 80 paise per hour and the equipment operating cost plus salary of the typist will be Rs. 40 per day. (10)

- i) What is the typist's utilization rate?
- ii) What is the average number of letters waiting to be typed?
- iii) What is the average waiting time needed to have a letter typed?
- iv) What is the total daily cost of waiting letters to be mailed?

Q. 5 a) Explain group replacement policy with example. (05)

- b) In a game of matching coins with two players A and B, suppose A wins one unit of value when there are two heads, wins nothing when there are two tails and losses $\frac{1}{2}$ unit of value when there is one head and one tail. Determine the payoff matrix, the optimal strategies for both the players. (05)

OR

- a) Explain Two Person Zero Sum game. (03)
- b) A fleet owner finds, from his past records, that the cost per year of running a vehicle, whose purchase price is Rs. 50,000 is : (07)

Year	1	2	3	4	5	6	7
Running cost (RS.)	5000	6000	7000	9000	11500	16000	18000
Resale value (RS.)	30000	15000	7500	3750	2000	2000	2000

Thereafter, the running cost increases by Rs. 2,000, but the resale value remains constant at Rs. 2,000. At what age is a replacement due?

- Q. 6 A sociologist plans a questionnaire survey, consisting of the following tasks, (10)

Activity	Immediate precedence	Duration (days)		
		Likely	Minimum	Maximum
A	-	5	4	6
B	-	12	8	16
C	A	5	4	12
D	B	3	1	5
E	D,A	2	2	2
F	B	5	4	6
G	C, E, F	14	10	18
H	G	20	18	34

- i) For this PERT network find the expected task durations and variances of the tasks.
- ii) Draw the network for this project and find critical path. What is the expected length of the critical path? What is the variance of the critical path?
- iii) What is the probability that the length of the critical path does not exceed 60 days?

OR

The table below gives the schedule of welding activities in an assembly shop: (10)

Activity	0-1	1-2	0-3	2-5	3-4	4-5	5-6
Duration (days)	2	4	2	1	2	5	3

- i) Draw the network diagram.
- ii) Calculate EST, LST, EFT, LFT and floats.
- iii) Mark the critical path and find the total project duration.