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10ME74

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Operations Research

Time: 3 hrs.

Max. Marks:100

**Note: 1. Answer any FIVE full questions, selecting
atleast TWO questions from each part.
2. Use of normal distribution chart is permitted.**

PART - A

- 1 a. List and explain different phases of operations research. (06 Marks)
b. Solve the following LP problem graphically :

$$\begin{aligned} \text{Minimize } z &= 2x_1 + 1.5x_2 \\ \text{Subject to } &x_1 + x_2 = 50 \\ &0.15x_1 - 0.05x_2 \geq 0 \\ &0.02x_1 - 0.03x_2 \geq 0 \\ &-0.05x_1 + 0.15x_2 \geq 0 \\ &x_1, x_2 \geq 0. \end{aligned}$$

(14 Marks)

- 2 a. Solve the following LPP by Big-M method :

$$\begin{aligned} \text{Minimum } Z &= 2x_1 + x_2 \\ \text{Subject to } &3x_1 + x_2 = 3 \\ &4x_1 + 3x_2 \geq 6 \\ &x_1 + 2x_2 \leq 3 \\ &x_1, x_2 \geq 0. \end{aligned}$$

(15 Marks)

- b. Write the dual of the following LPP :

$$\begin{aligned} \text{maximum } Z &= 3x_1 + 2x_2 + 1x_3 \\ \text{subject to } &5x_1 + 2x_2 + 3x_3 = 6 \\ &2x_1 + 3x_2 + x_3 \geq 2 \\ &x_1 + 2x_2 + 6x_3 = 5 \\ &x_1, x_2, x_3 \geq 0. \end{aligned}$$

(05 Marks)

- 3 a. Obtain basic feasible solution for the following transportation problem by

- i) North-West corner rule
ii) Matrix minima method
iii) Penalty method.

(10 Marks)

To \ Form	1	2	3	4	5	Capacity
A	5	8	6	6	3	800
B	4	7	7	6	5	500
C	8	4	4	6	4	900
Demand	400	400	500	400	800	

- b. Solve the travelling salesman problem for the following data :

$$C_{12} = 20 \quad C_{13} = 4 \quad C_{14} = 10 \quad C_{35} = 6 \quad C_{23} = 5 \quad C_{25} = 10 \quad C_{34} = 6 \quad C_{54} = 20$$

Where $C_{ij} = C_{ji}$ and there is no route between cities i and j the values for C_{ij} is not given.

(10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 4 Solve the following integer programming problem by Gomory cutting plane method :
- Maximum $Z = 3x_1 + 4x_2$
 Subject to $2x_1 + x_2 \leq 6$
 $2x_1 + 3x_2 \leq 9$
 $x_1, x_2 \geq 0$ and integers.

(20 Marks)

PART - B

- 5 a. Explain the Fulkerson rule of numbering of nodes with the help of an example. (05 Marks)
 b. A project consists of the activities as given in the table below :

Activity	Immediate predecessor	Time in weeks		
		t_0	t_p	t_l
A	-	1	7	1
B	A	1	7	4
C	-	2	8	2
D	B, C	1	1	1
E	C	2	14	5
F	A, C	2	8	5
G	D	3	15	6

- i) Draw the project network and find the critical path. (10 Marks)
 ii) What is the probability of completing the project in 17 weeks? (05 Marks)
- 6 a. Briefly explain the characteristics of queue. (06 Marks)
 b. A barber runs a one-man shop. Customers arrive on FCFS basis follows a Poisson pattern with a mean arrival rate of 30/hour. The barber's service time appears to be exponentially distributed with a mean of 1.5 minute. Determine :
- i) The expected number of customers in the shop
 ii) The expected number of customers waiting for service
 iii) The average time a customer should expect to wait for service
 iv) The probability that the service is idle. (14 Marks)
- 7 a. Briefly explain the following terms with reference to game theory :
 i) Saddle point ii) Pure strategy iii) Pay-off iv) Mixed strategy. (08 Marks)
 b. Two players A and B playing matching coins game in which each player has 4 coins ; a 1 Rs, a 2 Rs., a 5 Rs and a 10 Rs. Each player selects a coin without the knowledge of others choice. If the sum of the coins amount is an odd, player-A wins player-B's coin. If the sum the coins amount is even, B wins A's coin. Formulate this problem as game theory problem and find the optimal strategies for each player and game value. (12 Marks)
- 8 a. Briefly explain the Johnson algorithm for finding the sequence for 'n' jobs through 2 machines. (04 Marks)
 b. Find the sequence that minimizes the total elapsed time required to complete the following tasks :

Task	A	B	C	D	E	F	G
Time on M/c-1(Hrs)	3	8	7	4	9	8	7
Time on M/c-2(Hrs)	4	3	2	5	1	4	3
Time on M/c-3(Hrs)	6	7	5	11	5	6	12

Also find the percentage of utilization and idle time of each machine.

(16 Marks)
