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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 :

Minimize $z = 2x_1 + 1.5x_2$

Subject to $x_1 + x_2 = 50$

$0.15x_1 - 0.05x_2 \geq 0$

$0.02x_1 - 0.03x_2 \geq 0$

$-0.05x_1 + 0.15x_2 \geq 0$

$x_1, x_2 \geq 0.$ **(14 Marks)**

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

Minimum $Z = 2x_1 + x_2$

Subject to $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \leq 3$

$x_1, x_2 \geq 0.$ **(15 Marks)**

b. Write the dual of the following LPP :

maximum $Z = 3x_1 + 2x_2 + 1x_3$

subject to $5x_1 + 2x_2 + 3x_3 = 6$

$2x_1 + 3x_2 + x_3 \geq 2$

$x_1 + 2x_2 + 6x_3 = 5$

$x_1, x_2, x_3 \geq 0.$ **(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)**

Form \ To	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 :

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

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)**

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 barbar runs a one-man shop. Customers arrive on FCFS basis follows a Poisson pattern with a mean arrival rate of 30/hour. The barbar'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)**

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