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10ME74

Seventh Semester B.E. Degree Examination, Dec.2013/Jan.2014
Operations Research

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Old hens can be brought at Rs.50/- each and young hens can be brought at Rs.100/- each. The old hens lay 3 eggs/week and young hen's 5/week. Each egg cost 2 Rs. A hen cost Rs.5/week to feed, if a person has only Rs.2000 to spend for hens, formulate the problem to decide how many of each kind of hens should be buy? And he cannot house more than 40 hens, formulate the problem a LPP model. **(10 Marks)**

b. Solve the following LPP by Graphical method ,

$Z_{max} = 3x_1 + 4x_2$

Subject to constraints,

$5x_1 + 4x_2 \leq 200$

$3x_1 + 5x_2 \leq 150$

$5x_1 + 4x_2 \geq 100$

$8x_1 + 4x_2 \geq 80$ **(10 Marks)**

2 a. Solve the following LPP using Simplex method:

$Z_{max} = 10x_1 + 5x_2$

Subject to constraints,

$4x_1 + 5x_2 \leq 100$

$5x_1 + 2x_2 \leq 80$

$x_1 \& x_2 \geq 0$ **(08 Marks)**

b. Solve the given problem by using Big.M.

$Z_{min} = 5x_1 + 3x_2$

Subject to constraints,

$2x_1 + 4x_2 \leq 12$

$2x_1 + 2x_2 = 10$

$5x_1 + 2x_2 \geq 10$

$x_1 \& x_2 \geq 0$ **(12 Marks)**

3 a. Find the optimality for given problem and initial solution by using VAM method. **(10 Marks)**

Origin / Destinations	W_1	W_2	W_3	W_4	Supply
F_1	2	2	2	1	3
F_2	10	8	5	4	7
F_3	7	6	6	8	5
Demand	4	3	4	4	

3 b. A AML company has 5 tasks and 5 persons to perform. Determine the optimal assignment and to minimize the total cost. **(10 Marks)**

Jobs	Machines				
	A	B	C	D	E
P	6	7	5	9	4
Q	7	5	10	9	6
R	5	4	3	6	5
S	8	3	5	6	4
T	4	7	5	6	6

4 a. A traveling salesman has to visit 5 cities. He wishes to start from a particular city, visit each city once and return to his starting point find the least cost route. **(10 Marks)**

	A	B	C	D	E
A	∞	4	10	14	2
B	12	∞	6	10	4
C	16	14	∞	8	14
D	24	8	12	∞	10
E	2	6	4	16	∞

b. What is integer programming? Why it is needed and write the branch and bound algorithm. **(10 Marks)**

PART – B

5 a. The following table gives the activities in a construction project and other related information:

Activity	t_0	t_m	t_p
1 – 2	20	30	46
1 – 3	9	12	21
2 – 3	3	5	7
2 – 4	2	3	4
3 – 4	1	2	3
4 – 5	12	18	24

i) Draw a pert network
ii) Calculate project duration
iii) Find the critical path.
iv) Find the probability that the project will be completed within 50 days. **(14 Marks)**

b. Define the following: i) Normal time ii) Crash time iii) Free float **(06 Marks)**

6 a. Define: i) Fair game ii) Pure strategy iii) Mixed strategy **(06 Marks)**

b. Use dominance rule to find the optimum strategies for both the player. **(07 Marks)**

		B_1	B_2	B_3	B_4	B_5	B_6
Player	A_1	4	2	0	2	1	1
	A_2	4	3	1	3	2	2
	A_3	4	3	7	-5	1	2
	A_4	4	3	4	-1	2	2
	A_5	4	3	3	-2	2	2

c. Solve the game by graphically method.

$$\begin{bmatrix} 1 & -3 \\ 3 & 5 \\ -1 & 6 \\ 4 & 1 \end{bmatrix}$$

(07 Marks)

7 a. Write the characteristics of waiting lines. **(05 Marks)**

b. At what average rate must a clerk at super market work in order to ensure a probability of 0.9 that the customer will not have to wait longer than 12 minutes? It is assumed that there is only one counter to which customer arrive in a Poisson fashion at an average rate of 15/hr. The length of service by the clerk has an exponential distribution. **(07 Marks)**

c. In a hair dress by saloon with one barber, the customer arrived follows Poisson distribution at an average rate of one every 45 minutes. The service time is exponentially distributed with a mean of 30 minutes. Find:

i) Average number of customer in a saloon.

ii) Average waiting time of customer before service.

iii) Average idle time of barber. **(08 Marks)**

8 a. Define the following:

i) Idle time ii) Total elapsed time **(04 Marks)**

b. Write the assumption underlying the sequencing problem. **(04 Marks)**

c. Find the sequence that minimizes the total elapsed time, idle time and normal time.

Machine	Jobs				
	A	B	C	D	E
M_1	6	8	7	10	6
M_2	3	2	5	6	4
M_3	4	8	6	7	8

(12 Marks)

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