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06ME74

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

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer FIVE full questions, selecting at least TWO questions from each part.***
2. Use of normal distribution tables is permitted.

PART – A

1 a. Discuss the various phases in solving the OR problem. **(04 Marks)**

b. Old hens can be bought at ` 50/- each but young hen can be bought at ` 100/- each. The old hen lays 3 eggs/week and young hens lays 5 eggs/week. Each egg cost ` 2. A hen cost ` 5/week to feed, if a person has only ` 2000 to spend for hens, formulate the LPP problem to decide how many of each kind of hen should be buy? And he cannot hose more than 40 hens. **(08 Marks)**

c. Solve the following problem by using Graphical method:

$$Z_{min} = 20x_1 + 40x_2$$

Subject to constraints, $36x_1 + 6x_2 \geq 108$

$3x_1 + 12x_2 \geq 36$

$20x_1 + 10x_2 \geq 100$; $x_1, x_2 \geq 0$ **(08 Marks)**

2 a. Solve the following problem by simplex method:

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

Subject to constraints, $x_1 + 2x_2 \leq 2000$

$x_1 + x_2 \leq 1500$

$x_2 \leq 600$; $x_1, x_2 \geq 0$ **(10 Marks)**

b. Solve the following problem by Two Phase simplex method:

$$Z_{min} = 3x_1 + 2x_2 + 4x_3$$

Subject to constraints, $2x_1 + x_2 + 3x_3 = 60$

$3x_1 + 3x_2 + 5x_3 \geq 120$

$x_1, x_2, x_3 \geq 0$ **(10 Marks)**

3 a. The following table shows the necessary information on the available supply and demand unit cost of each ware house and markets.

	I	II	III	IV	Supply
A	5	2	4	3	22
B	4	8	1	6	15
C	4	6	7	5	08
Demand	07	12	17	09	

The shipping clerk has worked out the following schedule from his experience.

12 units from A-II, 1 unit from A-III, 9 units from A-IV

15 units from B-III, 7 units from C-I, 1 unit from C-III

Check and see the clerk has optimum schedule and if it is not a optimum schedule find the optimal cost by MODI method. **(10 Marks)**

b. Four professors are capable of teaching any one of the four different subjects. Class preparation time (hrs) for different subjects varies from professor to professor and is given in the table. Each professor should be assigned only one subject. Find the schedule so as to minimize the total subject preparation time for all subjects. **(10 Marks)**

	S_1	S_2	S_3	S_4
P_1	2	10	9	7
P_2	15	4	14	8
P_3	13	14	16	11
P_4	3	15	13	8

4 a. Six jobs are to be processed on two machines A and then on machine B. Time in hours taken by each job on each machine is given below. Determine the optimum sequence of jobs that minimize the total elapsed time to complete the jobs in the minimum time. **(08 Marks)**

	1	2	3	4	5	6
M/c A	5	3	2	10	12	6
M/c B	3	2	5	11	10	7

b. A book binder has one printing press, one binding machine and one finishing machine. The time required to perform the printing, binding, finishing operation as follows. Determine the order in which the books should be processed in order to minimize the total time required to process all the books. Find the elapsed time and total time required. **(12 Marks)**

	1	2	3	4	5
Printing time	40	90	80	60	50
Binding time	50	60	20	30	40
Finishing time	80	100	60	70	100

PART – B

5 a. A box office ticket window is being manned by a single server. Customer arrive to purchase tickets according to a Poisson process with a mean rate of 30 per hour. The time required to serve a customer has an exponential distribution with a mean of 90 second. Calculate

(i) Mean queue length (ii) Mean line length

(iii) Mean waiting time in system (iv) Mean waiting time in line. **(10 Marks)**

b. The machine in production shop breakdown at an average of 2 per hour. The non-productive time of any machine costs ` 30 per hour. If the cost of repairman is ` 50 per hour and the repair rate is 3 per hour. Calculate

(i) Number of machines not working at any point of time.

(ii) Average time that a machine is waiting for the repairman.

(iii) Cost of non-productive time of the machine operator.

(iv) Expected cost of system per hour. **(10 Marks)**

6 a. Explain the following:

(i) Optimistic time (ii) Most likely time (iii) Pessimistic time (iv) Crash time **(08 Marks)**

b. Draw the PERT network and find the critical path by using the following table and also calculate (i) total project duration (ii) find the probability that the project will be computed 3 days earlier than schedule time (iii) find the probability 3 days latter than schedule time. **(12 Marks)**

Activity	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
t_o	2	2	5	1	5	2	3	2	7
t_m	5	5	11	4	11	5	9	2	13
t_p	14	8	29	7	17	14	27	8	31

7 a. Define the following:
(i) Saddle point (ii) Pure strategy **(04 Marks)**

b. Solve the given problem by using Dominance rule. **(08 Marks)**

		B				
		B_1	B_2	B_3	B_4	B_5
	A_1	2	4	3	8	4
A	A_2	5	6	3	7	8
	A_3	6	7	9	8	7
	A_4	4	2	8	4	3

c. Solve the game by graphical method. **(08 Marks)**

		B			
		I	II	II	IV
	I	19	6	7	5
A	II	7	3	14	6
	III	12	8	18	4
	IV	8	7	13	-1

8 a. Explain the methods used in integer programming problems. **(05 Marks)**

b. Find the optimum integer solution to the following all I..P.P.

$Z_{max} = x_1 + 2x_2$

Subject to the constraints, $2x_1 \leq 7$

$x_1 + x_2 \leq 7$

$2x_1 \leq 11$; $x_1 , x_2 \geq 0$ and are integers. **(15 Marks)**

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