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06ME74

Seventh Semester B.E. Degree Examination, June / July 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. Explain the characteristics of operations research. **(06 Marks)**

b. Explain in brief various types of models. **(06 Marks)**

c. An institution is planning to organize seminars for the next five days. There is arrangement of dinner on each day. The requirement of napkins during the five days are as follows:

Days	1	2	3	4	5
Minimum napkins required	75	60	110	65	125

The institute does not have any napkins in the beginning. After five days, the institute has no more use of napkins. A new napkin costs Rs.4.00, washing charges for a used one is Rs.1.50. A napkin given for washing after the dinner on first day is returned on third day before dinner and so on. The institute decided to accumulate the used napkins and send them for washing just in time to be used when they return. Formulate this as a linear programming model to minimize the total cost of napkins. **(08 Marks)**

2 a. Define slack and artificial variable. **(03 Marks)**

b. With an example prove that the dual of the dual is primal. **(05 Marks)**

c. Solve the following LPP using simplex method. Also determine the alternate optimal solution if any.

Maximize $z = 2000x_1 + 3000x_2$

Subject to $6x_1 + 9x_2 \le 100$

$2x_1 + x_2 \le 20$

$x_1, x_2 \ge 0$ **(12 Marks)**

3 a. Find the optimal solution for the following transportation problem to minimize the total cost. **(10 Marks)**

		Warehouse			
		W_1	W_2	W_3	Supplies
Plants	P_1	7	6	9	20
	P_2	5	7	3	28
	P_3	4	5	8	17
	Demands	21	25	19	

b. Five machines are to be assigned to five jobs. The cost of assigning each job to each machine is given in the following matrix. Which machine to be assigned to which job to minimize the total cost of assignment? **(10 Marks)**

Machine \ Jobs	J_1	J_2	J_3	J_4	J_5
M_1	11	17	8	16	20
M_2	9	7	12	6	15
M_3	13	16	15	12	16
M_4	21	24	17	28	26
M_5	14	10	12	11	15

4 a. List any four assumptions made in sequencing. **(04 Marks)**

b. What do you mean by degeneracy in transportation problem? How do you resolve it? **(06 Marks)**

c. Six jobs are to be processed on three machines A, B and C in the order ABC. The processing times in hours of each job on three machines is given below. Find the optimum sequence of jobs, minimum elapsed time and idle time for each machine **(10 Marks)**

Jobs	Processing on A	Processing on B	Processing on C
1	8	3	8
2	3	4	7
3	7	5	6
4	2	2	9
5	5	1	10
6	1	6	9

PART – B

5 a. Explain any four characteristics of queuing system. **(08 Marks)**

b. Arrival rate at a telephone booth are considered to be Poisson with an average time of ten minutes between one arrival and the next. The length of the phone call is assumed to be distributed exponentially with mean 3 minutes.

(i) What is the probability that a person arriving at the booth will have to wait?

(ii) What is the average length of queue?

(iii)The telephone department will install a second booth when convinced that an arrival would expect waiting for at least three minutes for phone. By how much should the flow of arrivals increase in order to justify a second booth? **(12 Marks)**

6 a. Define slack, float and critical path. **(06 Marks)**

b. A project is composed of seven activities whose three time estimates (in weeks) are listed below.

Activity	1 – 2	1 – 3	2 – 4	2 – 5	3 – 5	4 – 6	5 – 6
Optimistic time	1	1	2	1	2	2	3
Most likely time	1	4	2	1	5	5	6
Pessimistic time	7	7	8	1	14	8	15

i) Draw the network.

ii) Compute the expected duration and variance of each activity.

iii)Compute the expected project length and variance of the project length.

iv) Compute the probability that the project will be completed 4 weeks earlier than expected.

v) Compute the probability that the project will be completed 4 weeks later than expected. **(14 Marks)**

7 a. Define the following: i) Pure strategy ii) Mixed strategy iii) Saddle point. **(06 Marks)**

b. Solve the following game and state the optimum strategies: **(06 Marks)**

		Player B		
		B_1	B_2	B_3
Player A	A_1	1	7	2
	A_2	6	2	7
	A_3	6	1	6

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

		Player B				
		B_1	B_2	B_3	B_4	B_5
Player A	A_1	-5	5	0	-1	8
	A_2	8	-4	-1	6	-5

8 a. Define pure and mixed integer programming problems. **(04 Marks)**

b. Explain the significance of integer programming problems. **(06 Marks)**

c. Explain the iterative procedure of Gommory's cutting plane method. **(10 Marks)**

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