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10ME74

Seventh Semester B.E. Degree Examination, June/July 2017
Operations Research

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Explain in brief different phases of operations research. (06 Marks)
 b. Mention four application areas of operation research. (04 Marks)
 c. A furniture maker has 6-units of wood and 28 hrs of free time, in which he will make two – models of decorative screens. He estimates that model-1 requires 2-units of wood and 7-hrs of working time, while model-2 requires 1-unit of wood and 8-hrs of working time. The prices of the models are Rs.120/- and Rs. 80/- per screen respectively. Formulate this problem as L.P.P and solve it by graphical method. (10 Marks)

- 2 a. Define :
 i) Basic feasible solution
 ii) Optimal solution
 iii) Un bounded solution. (06 Marks)
 b. Use the Simplex method to solve following L.P.P
 Maximize $Z = 4x_1 + 10x_2$
 Subject to $2x_1 + x_2 \leq 50$
 $2x_1 + 5x_2 \leq 100$
 $2x_1 + 3x_2 \leq 90$
 $x_1, x_2 \geq 0$ (14 Marks)

- 3 a. Solve the following transportation problem (minimization)

	D ₁	D ₂	D ₃	D ₄	Supply
S ₁	21	16	25	13	11
S ₂	17	18	14	23	13
S ₃	32	27	18	41	19
Demand	6	10	12	15	

- i) Find IBFS by VAM method
 ii) Check for optimality by MODI method. (14 Marks)
 b. Find the optimal assignment cost for following assignment problem.

		Operators			
		I	II	III	IV
Machine	A	10	5	13	15
	B	3	9	18	3
	C	10	7	3	2
	D	5	11	9	7

(06 Marks)

- 4 Find the optimum integer solution to following I.P.P

$$\text{Maximize } Z = x_1 + 2x_2$$

$$\text{Subjected to } x_1 + x_2 \leq 7$$

$$2x_1 \leq 11$$

$$2x_2 \leq 7$$

$$x_1, x_2 \geq 0 \text{ and are integers.}$$

(20 Marks)

PART – B

- 5 a. A project consist of activities as given in the table :

Activities	Predecessor	Estimated 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
 ii) Identify the critical path and determine the expected completion time of project
 iii) What is the probability that project would be completed in 17 weeks? (16 Marks)
 b. Draw the graph of direct cost, indirect cost and total cost of a project. Show the optimum duration and least cost of project on graph. (04 Marks)
- 6 a. Briefly explain the important characteristics of queuing system. (08 Marks)
 b. A box office ticket window manned by single server, customers arrive to purchase tickets according to Poisson's distribution with a mean rate of 30/hr. The time required to serve a customer has an exponential distribution with a mean of 90 sec. Determine :
 i) Mean queue length
 ii) Mean waiting time in the queue
 iii) Probability that there are 3 or more customers in the system
 iv) Percentage of time the server is busy. (12 Marks)

- 7 a. Explain :
 i) pure strategy
 ii) mixed strategy. (04 Marks)
 b. Find the optimal strategies and value of game by using dominance rule for following game.

$$\begin{bmatrix} -4 & 6 & 3 \\ -3 & -3 & 4 \\ 2 & -3 & 4 \end{bmatrix}$$

(08 Marks)

- c. Solve the following game graphically

		Player B				
		B ₁	B ₂	B ₃	B ₄	B ₅
Player A	A ₁	2	-1	5	-2	6
	A ₂	-2	4	-3	1	0

Find the strategies for player A and B and also value of game. (08 Marks)

- 8 a. Explain the following :
 i) idle time on machine
 ii) total elapsed time (04 Marks)
 b. Mention any six assumptions made for sequencing problems. (06 Marks)
 c. There are 5-jobs each of which must go through the two machines A and B in order A, B processing times are given below :

Jobs	1	2	3	4	5
Time on (hrs) machine A	5	1	9	3	10
Time on (hrs) machine B	2	6	7	8	4

Determine the sequence for 5-jobs that will minimize the total elapsed time. Also calculate minimum elapsed time and idle times for both the machines. (10 Marks)

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