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

Maximize $Z = x_1 + 2x_2$

Subjected to $x_1 + x_2 \leq 7$

$2x_1 \qquad \leq 11$

$\qquad 2x_2 \leq 7$

$\qquad x_1, x_2 \geq 0$ 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) Mena 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

| | | B₁ | B₂ | B₃ | B₄ | B₅ |

Player A

$$\begin{array}{c} A_1 \\ A_2 \end{array} \begin{bmatrix} 2 & -1 & 5 & -2 & 6 \\ -2 & 4 & -3 & 1 & 0 \end{bmatrix}$$

   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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