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Seventh Semester B.E. Degree Examination, June/July 2013
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 table is permitted.

PART – A

- 1 a. Explain different phases of operations research. (06 Marks)
 b. Mohan breweries Ltd., has two bottling plants, one located at Solan and other at Mohan Nagar. Each plant produces three drinks A, B and C types. The number of bottles produced per day are as follows: (06 Marks)

Bottle type	Plant at	
	Solan	Mohan Nagar
A	1500	1500
B	3000	1000
C	2000	5000

A market study indicates that during next month, there will be demand of 20000 bottles of 'A', 40000 bottles of B and 44000 bottles of type C. The operating cost/day for plants at Solan and Mohan Nagar are 600 and 400 monetary units. For how many days each plant be run in a month so as to minimize the production cost, while still meeting the market demand. Formulate the problem as LPP.

- c. Solve the following LPP by graphical method:

$$\begin{aligned} \text{Maximize, } z &= 5x_1 + 4x_2 \\ \text{Subject to, } 6x_1 + 4x_2 &\leq 24 \\ x_1 + 2x_2 &\leq 6 \\ x_2 &\leq 2 \\ -x_1 + x_2 &\leq 1 \\ x_1 \geq 0, x_2 &\geq 0 \end{aligned}$$

(08 Marks)

- 2 a. Solve the following LPP by Big 'M' method:

$$\begin{aligned} \text{Maximize, } z &= 3x_1 - x_2 \\ \text{Subject to, } 2x_1 + x_2 &\geq 2 \\ x_1 + 3x_2 &\leq 3 \\ 8x_2 &\leq 4 \\ x_1 \geq 0, x_2 &\geq 0 \end{aligned}$$

(10 Marks)

- b. Solve the following LPP by Dual-Simplex method:

$$\begin{aligned} \text{Minimize, } z &= x_1 + x_2 \\ \text{Subject to, } 2x_1 + x_2 &\geq 4 \\ x_1 + 7x_2 &\geq 7 \\ x_1 \geq 0, x_2 &\geq 0 \end{aligned}$$

(10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

- 3 Find the optimum solution to following transportation problem in which the cells contain transportation costs in rupees. (20 Marks)

	W ₁	W ₂	W ₃	W ₄	W ₅	Supply
F ₁	7	6	4	5	9	40
F ₂	8	5	6	7	8	30
F ₃	6	8	9	6	5	20
F ₄	5	7	7	8	6	10
Requirements	30	30	15	20	5	

- 4 a. A company is faced with the problem of assigning six different machines to five different jobs. The cost are estimated as follows (Hundred of Rs.) (12 Marks)

		Jobs				
		1	2	3	4	5
Machines	1	2.5	5.0	1.0	6.0	1.0
	2	2.0	5.0	1.5	7.0	3.0
	3	3.0	6.5	2.0	9.0	4.5
	4	3.5	7.0	2.0	9.0	4.5
	5	4.0	7.0	3.0	9.0	6.0
	6	6.0	9.0	5.0	10.0	6.0

- b. There are seven jobs, they are to processed in the order AB on machines A and B. Machining times are given below. Determine the optimum sequence, total elapsed time and idle times for both machines. (08 Marks)

Jobs:	1	2	3	4	5	6	7
Machine A:	3	12	15	6	10	11	9
Machine B:	8	10	10	6	12	1	3

PART – B

- 5 a. What is service discipline? State various disciplines with example. (06 Marks)
- b. Workers come to tool store room to receive tools for accomplishing a particular project assigned to them. The average time between two arrivals is 60 seconds and arrival are assumed to be in Poisson distribution. Average service time of the tool room attendant is 40 seconds. Determine
- Average queue length.
 - Average length of non-empty queues.
 - Average number of workers in system including the workers being attended.
 - Mean waiting time of arrival.
 - Average waiting time of an arrival who units.
 - Whether to go in for an additional tool room attendant which will minimize the combined cost of attendant's idle time and the cost of workers waiting time. Assume the change of a worker is Rs.4 per hour and that of tool room attendant as Rs.0.75 per hour. (14 Marks)

- 6 a. A project has eleven activities as below:

Activity	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7	7-8
Duration(days)	2	8	10	6	3	3	7	5	2	8	3

- i) Draw network ii) Find earliest, latest start and finish times for all activity iii) Compute total and free floats iv) identify critical path. (12 Marks)

- 6 b. In the PERT network shown in Fig. Q6 (b), the activity estimates in weeks are given. If the scheduled completion time is 23 weeks. Calculate the slack for each event and identify critical path. What is the probability that project will be completed on the scheduled date?

(08 Marks)

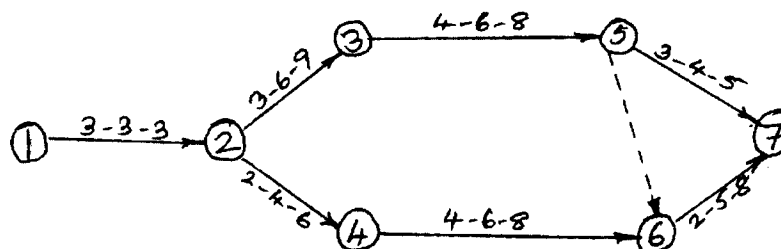


Fig. Q6 (b)

- 7 a. Define : i) Pure strategy ii) Mixed strategy iii) Two person zero sum game. (06 Marks)
b. Reduce the following game by dominance property and solve it: (06 Marks)

		Player B				
		1	2	3	4	5
Player A	I	1	3	2	7	4
	II	3	4	1	5	6
	III	6	5	7	6	5
	IV	2	0	6	3	1

- c. Solve the following game by graphical method:

(08 Marks)

		Player B				
		I	II	III	IV	V
Player A	1	-5	5	0	-1	8
	2	8	-4	-1	6	-5

- 8 a. Write a note on solution methods of integer programming. (06 Marks)
b. Solve the following:

$$\text{Maximize, } z = 2x_1 + 3x_2$$

$$\text{Subject to, } 6x_1 + 5x_2 \leq 25$$

$$x_1 + 3x_2 \leq 10$$

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

(14 Marks)
