USN ☐☐☐☐☐☐☐☐☐☐   **EE762**

Seventh Semester B.E. Degree Examination, May / June 08
Operations Research

Time: 3 hrs.   Max. Marks:100

Note : *1. Answer any FIVE full questions.*
2. Normal distribution tables permitted.

1   a. What is Operations research? Briefly discuss the scope of operational research. What are the
       limitations of OR?   **(10 Marks)**

    b. A company has three operational departments (weaving, processing and packing) with
       capacity to produce three different types of clothes namely suitings, shirtings and woolens
       yielding the profits of Rs 2, Rs 4, and Rs 3 per meter respectively. One meter suiting requires
       3 minutes in weaving, 2 minutes in processing and 1 minute in packing. 1 meter shirting
       requires 4 minutes in weaving, 1 minute in processing and 3 minutes in packing, while one
       meter woolen requires 3 minutes in each department. In a week total run time of each
       department is 60, 40 and 80, in weaving, processing and packing departments respectively.
       Formulate the linear programming problem to find the product mix to maximize the profit.
                                                                             (10 Marks)

2   a. What are the limitations and applications and advantages of linear programming?   **(10 Marks)**

    b. Using Simplex method, solve the following LPP.
       Maximize $z = x_1 + 2x_2 + x3$
       Subject to constraints $2x_1 + x_2 - x_3 \leq 2$
       $$-2x_1 + x_2 - 5x_3 \geq -6$$
       $$4x_1 + x_2 + x_3 \leq 6$$
       $$x_1, x_2, x_3 \geq 0.$$
                                                                             (10 Marks)

3   a. Obtain an initial basic feasible solution to the following transportation problem by Vogel's
       method. Is this solution an optimal solution? If not, obtain the optimal solution by MODI
       method. If a company is spending Rs 1000 on transportation of its units to four ware houses
       form three factories. What can be the maximum saving by optimal scheduling?   **(15 Marks)**

	W_1	W_2	W_3	W_4	Available
F_1	19	30	50	10	7 ↓
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Requirement →	5	8	7	14	

    b. State the transportation problem in general terms and explain the problem of degeneracy.
                                                                             (05 Marks)

4   a. Differentiate between transportation problem and assignment problem.   **(05 Marks)**

    b. A car hire company has one car at each of five depots a, b, c, d and e. A customer requires a
       car in each town, namely A, B, C, D and E. Distance (in kms) between depots (origins) and
       towns (destinations) are given in the following distance matrix.   **(15 Marks)**

	a	b	c	d	e
A	160	130	175	190	200
B	135	120	130	160	175
C	140	110	155	170	185
D	50	50	80	80	110
E	55	35	70	80	105

How should cars be assigned to customers so as to minimize the distance traveled?

5   a. What are the Basic steps of PERT/CPM and Applications Areas to PERT/CPM? **(08 Marks)**

     b. The following table lists the jobs of a network with their estimates optimistic (t_o), most likely (t_m), and pessimistic (t_p), as given in table.

Job (i-j)	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
t_o	3	2	6	2	5	3	3	1	4
t_m	6	5	12	5	11	6	9	4	19
t_p	15	14	30	8	17	15	27	7	28

        i)   Draw the project network.

        ii)   Calculate the length and variance of the critical path and

        iii) What is the approximate probability that the jobs on the critical path will be completed in 41 days? **(12 Marks)**

6   a. Define Inventory. What are the different types of Inventory in Industries? Briefly explain the major decisions concerning inventory. **(08 Marks)**

     b. Given the following data for an item of uniform demand, instantaneous delivery time and back order facility. Annual Demand = 800 units, cost of an item = Rs 40, Ordering cost = Rs 800, Inventory carrying cost = 40%. Find out i) Minimum cost order quantity. ii) Time between orders iii) Total annual cost. **(12 Marks)**

7   a. What is a Replacement Problem? Describe some important replacement situations. **(08 Marks)**

     b. A computer contains 10,000 resistors. When any one of the resistor fails, it is replaced. The cost of replacing a single resistor is Rs 10 only. If all the resistors are replaced at the same time, the cost per resistor would be reduced to Rs 3.50. The percent surviving by the end of month t is as follows :

Month (t)	0	1	2	3	4	5	6
% surviving by the end of Month	100	97	90	70	30	15	0

        What is the optimum plan? **(12 Marks)**

8   a. Explain Maximin – MiniMax principle. **(04 Marks)**

     b. Use the relation of dominance to solve the game whose pay off matrix to the player A is given in the table. **(05 Marks)**

		B	
	I	II	III
I	1	7	2
A **II**	6	2	7
III	5	2	6

     c. An air lines organization has one reservation clerk on duty in its local branch at any given time. The clerk handles information regarding passenger reservation and flight timings. Assume that the number of customers arriving during any given period is Poisson distributed with an arrival rate of eight per hour and that the reservation clerk can serve a customer in six minutes on an average, with an exponentially distributed service time.

        i)   What is the probability that the system is busy?

        ii)   What is the average time a customer spends in the system?

        iii) What is the average length of the queue and what is the number of customer in the system? **(11 Marks)**

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