Hall Ticket No | | | | | | | | | | | Question Paper Code: AHS012

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech V Semester End Examinations(Regular) - November, 2019

Regulation: IARE – R16

OPTIMIZATION TECHNIQUES

Time: 3 Hours **(Common to CSE | IT | EEE)** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Define Operations Research. List characteristics of Operations Research. **[7M]**

   (b) Solve the following Linear Programming problem by using simplex method
   Maximize Z = $8000x_1 + 7000x_2$
   subjected to
   $3x_1 + x_2 \leq 66$,
   $x_1 + x_2 \leq 45$,
   $x_1 \leq 20$,
   $x_2 \leq 40$
   where $x_1, x_2 \geq 0$ **[7M]**

2. (a) What are various methods involved in solving problems with artificial variables? Explain steps involved in two phase method. [7M]

   (b) A company manufactures two products X and Y whose profit contributions are Rs. 10 and Rs. 20 respectively. Product X requires 5 hours on machine I, 3 hours on machine II and 2 hours on machine III. The requirement of product Y is 3 hours on machine I, 6 hours on machine II and 5 hours on machine III. The available capacities for the planning period for machine I, II and III are 30, 36 and 20 hours respectively.Formulate linear programming model and find the optimal product mix to get maximum profit. [7M]

UNIT – II

3. (a) Define feasible, basic feasible and optimal solution in transportation model. List variants in transportation problem. [7M]

   (b) A company has three plants at locations A, B and C which supply to warehouses located at D,E,F,G and H. Monthly plant capacities are 800,500,and 900 units respectively. Monthly warehouse requirement are 400,400,500,400 and 500 units respectively. Unit transportation cost are given in Table 1. Determine an optimum distribution for the company in order to minimize the total transportation cost. [7M]

Table 1

	D	E	F	G	H
A	5	8	6	6	3
B	4	7	7	6	5
C	8	4	6	6	4

4. (a) Why does Vogel's approximation method provide a good initial feasible solution than other methods? Explain with an example. [7M]

   (b) A company has 5 jobs to be done. The following matrix shown in Table 2 the return in rupees on assigning i^{th} (I= 1,2,3,4,5) machines to the job(j= A,B,C,D,E). Assign the five jobs to the five machines so as to maximize the total expected profit. [7M]

Table 2

Machines	A	B	C	D	E
1	5	11	10	12	4
2	2	4	6	3	5
3	3	12	5	14	6
4	6	14	4	11	7
5	7	9	8	12	5

UNIT – III

5. (a) Explain about Weighed Short Processing Time(WSPT) rule used in solving sequence problems. [7M]

   (b) There are five jobs each of which must go through the two machines A and B in the order AB. Processing times are given below:

Table 3

Job	1	2	3	4	5
Time for A	5	1	9	3	10
Time for B	2	6	7	8	4

Determine a sequence for five jobs that will minimize the elapsed time T. calculate the total idle time for the machine in this period.

[7M]

6. (a) State the rules for a game theory? Explain about dominated moves in game theory with an example. [7M]

(b) Solve the game whose payoff matrix is as shown in Figure 1: [7M]

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

Figure 1

UNIT – IV

7. (a) Explain fundamental concepts involved in dynamic programming techniques with an example. [7M]

(b) The Figure 2 shows the route map of various branch offices of a company. The marketing executive of the company should like to start from Head office at A and reach the branch office at B by traveling shortest path and visiting as many as branch offices. Help him to plan his journey by using dynamic programming technique. [7M]

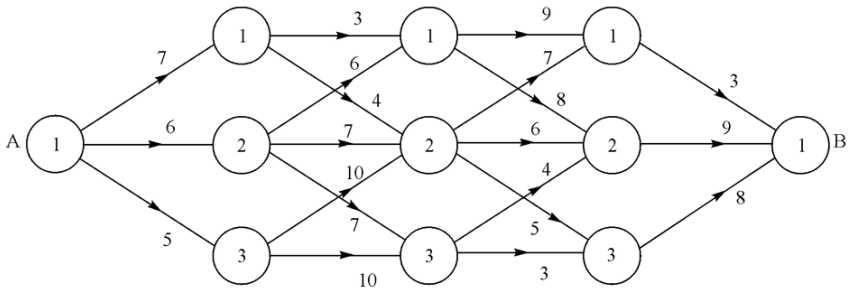

Figure 2

8. (a) Define dynamic programming. What are the characteristics of it? [7M]

(b) In a cargo-loading problem, there are four items of different unit weight and value as given in Table 4. The maximum cargo load is 6 units. How many units of each item are loaded to maximize the value? [7M]

Table 4

Items i	Weight w1	Values per unit v1
1	1	1
2	3	3
3	4	75
4	4	114

UNIT – V

9. (a) Explain various steps in the direct successive quadratic programming solution. [7M]

   (b) Maximize Z = 3.6 x_1 – 0.4$x_1$2 + 1.6x_2 – 0.2 $x_2$2
   subject to constraints
   2x_1 + x_2 <=10 and both x_1 and x_2 are >=0 by using direct successive quadratic approximation method [7M]

10. (a) Compare the treatment of inequality constraints in the GRG and CVM algorithms. How do the methods of estimating multiplier values differ? [7M]

    (b) Solve the problem Minimize f(x) = 6 x_1x2^{-1} + x_2 x2^{-2}
    Subjected to
    h(x) = x_1 x2^{-2} $\geq$ 0
    g (x) = x_1+ x2^{-1}$\geq$ 0
    From the initial feasible estimate x^0 = (2,1) using Constrained Variable Method with initial metric H^0= I. At the initial point (2, 1), the function gradients are
    $\nabla f = \left(\frac{23}{4}, \frac{47}{4}\right)^T$, $\nabla h = (1,2)^T$, $\nabla g = (1,1)^T$ [7M]