

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**

Fifth Semester B.Tech Degree Regular and Supplementary Examination December 2020

**Course Code: EC363****Course Name: OPTIMIZATION TECHNIQUES**

Max. Marks: 100

Duration: 3 Hours

**PART A***Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) State and prove the necessary condition for existence of relative minimum or maximum for a single variable objective function. (3)
- b) Using method of Lagrange multipliers, Minimize  $f(x_1, x_2, x_3) = x_1^2 + x_2^2 + x_3^2$  subject to constraints  $4x_1 + x_2^2 + 2x_3 = 14$  (7)
- c) Minimize  $f(X) = x_1^2 + x_2^2$  (5)  
Subject to  $g_1(X) = x_1x_2 - 1 = 0$  by direct substitution method
- 2 a) Solve the following LPP using Simplex method (7)  
Maximize  $Z=3x_1 + 2x_2$   
Subject to the constraints  
 $x_1 + x_2 \leq 4$   
 $x_1 - x_2 \leq 2$   
and  $x_1, x_2 \geq 0$
- b) Solve the following LPP graphically, (8)  
Minimize  $Z=20x_1 + 40x_2$   
Subject to the constraints  
 $36x_1 + 6x_2 \geq 108$   
 $3x_1 + 12x_2 \geq 36$   
 $20x_1 + 10x_2 \geq 100$   
and  $x_1, x_2 \geq 0$
- 3 a) Determine whether the following function is convex or concave (5)  
 $f(X) = x_1^2 + x_2^2 + x_3^2 - 4x_1 - 8x_2 - 12x_3 + 56$

b) Solve duality solve the problem

(10)

$$\text{Minimize } Z = 4x_1 + 3x_2 + 6x_3$$

Subject to the constraints

$$x_1 + x_3 \geq 2$$

$$x_2 + x_3 \geq 5$$

$$\text{and } x_1, x_2, x_3 \geq 0$$

### PART B

Answer any two full questions, each carries 15 marks.

4 a) Solve the following Transportation problem using MODI Method

(7)

	$D_1$	$D_2$	$D_3$	Supply
$S_1$	10	9	8	8
$S_2$	10	7	10	7
$S_3$	11	9	7	9
$S_4$	12	14	10	4
Demand	10	10	8	

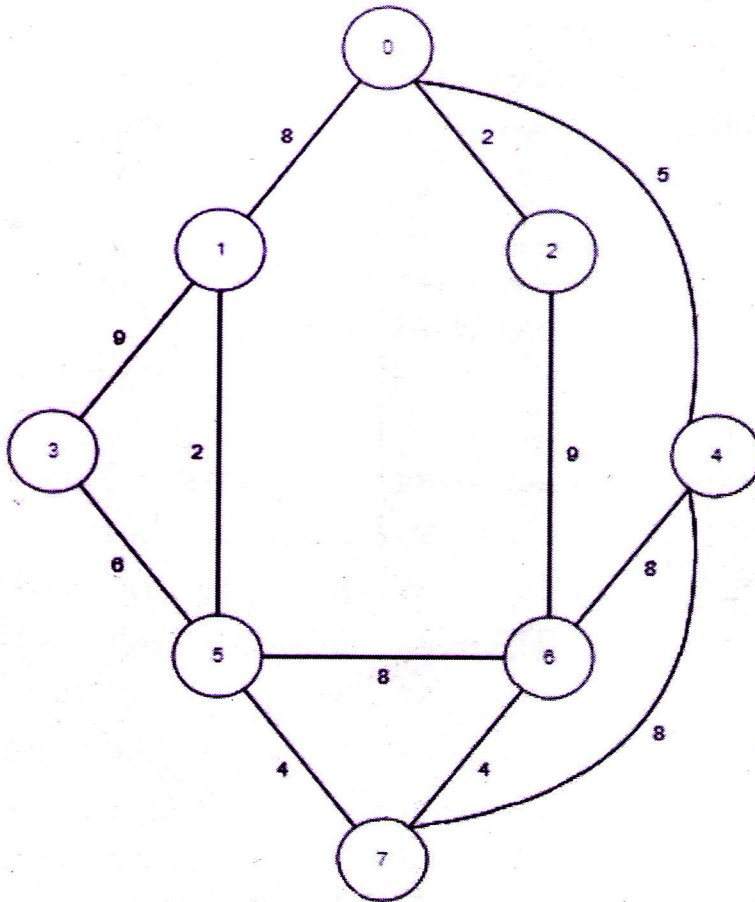
b) Find the starting solution of the following TP using (i)NWC method (ii)LC method

(8)

	$D_1$	$D_2$	$D_3$	Supply
$O_1$	1	2	6	7
$O_2$	0	4	2	12
$O_3$	3	1	5	11
Demand	10	10	10	

5 a) Find the minimum spanning tree to the following network by PRIM's algorithm.

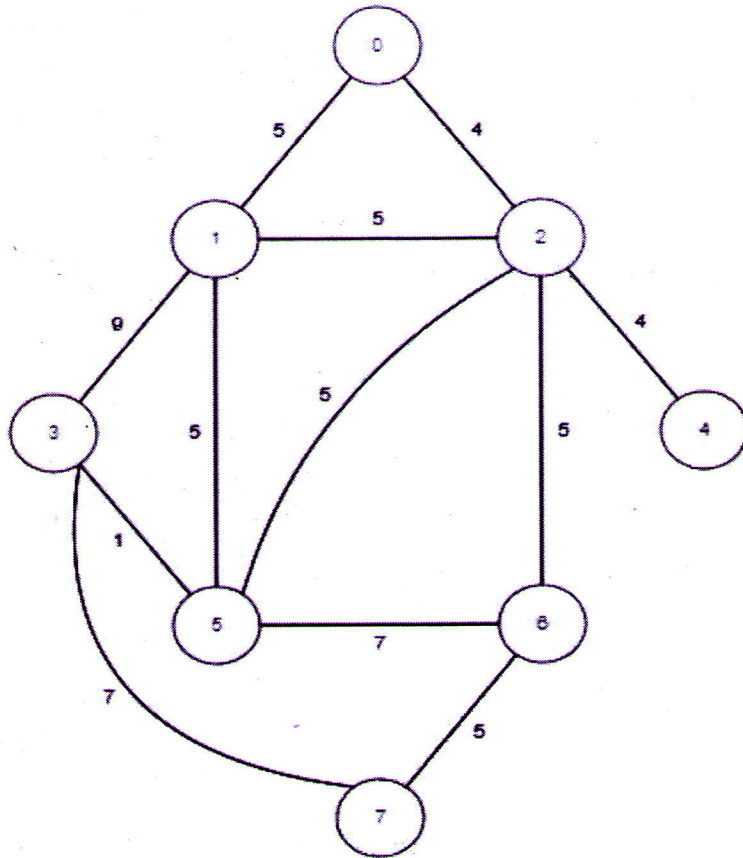
(7)



b) Define an unbalanced TP .Find the IBFS of the following unbalanced TP using Vogel's approximation method (8)

	$D_1$	$D_2$	$D_3$	$D_4$	Supply
$O_1$	6	1	9	3	70
$O_2$	11	5	2	8	55
$O_3$	10	12	4	7	70
Demand	85	35	50	45	

6 a) Using Dijkstra's method find the shortest path from node 1 to node 7 from the following network path model. (7)



- b) Is the following two-person zero sum game stable? Solve the game. (8)

Player B

$$\text{Player A} \begin{bmatrix} 5 & -10 & 9 & 0 \\ 6 & 7 & 8 & 1 \\ 8 & 7 & 15 & 1 \\ 3 & 4 & -1 & 4 \end{bmatrix}$$

### PART C

*Answer any two full questions, each carries 20 marks.*

- 7 a) Use Fibonacci search method to find the minimum of the function  $f(x) = x^2$  in the interval  $(-5, 15)$ , take  $n=7$ . (10)
- b) Minimize  $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$  starting from the point  $X_1 = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$  using steepest descent method. (10)
- 8 a) Using Hooke-Jeeves method Minimize  $Z = f(x, y) = (x^2 + y - 11)^2 + (y^2 + x - 7)^2$  by taking  $\Delta x = \Delta y = 0.5$  and starting from the point  $(0,0)$  (15)
- b) What are the generic requirements of the fitness function? (5)
- 9 a) Explain in detail the different steps involved in genetic algorithm. (10)
- b) Minimize the function  $f(\lambda) = 3000 - 100\lambda^2 - 4\lambda^5 - 6\lambda^6$  using Newton-Raphson method starting with  $\lambda_1 = 1, \epsilon = 0.01$  (10)

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