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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH. DEGREE EXAMINATION, DECEMBER 2018

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 the necessary and sufficient condition for existence of maximum or minimum for a multivariable objective function without constraints. (3)

b) Find the extreme points of the function $f(x_1,x_2,x_3) = x_1 + 2x_3 + x_2x_3 - x_1^2 - x_2^2 - x_3^2$. (5)

c) Maximize $f(x_1,x_2) = 3.6x_1 + 16x_2 - 0.4x_1^2 - 0.2x_2^2$ subject to the constraints $2x_1 + x_2 \le 10, x_1, x_2 \ge 0$ using Kuhn-Tucker conditions. (7)

2 a) Solve the following LPP using simplex method. Maximize $Z = 10x_1 + 15x_2 + 20x_3$ subject to the constraints $2x_1 + 4x_2 + 6x_3 \le 24, 3x_1 + 9x_2 + 6x_3 \le 30, x_1, x_2, x_3 \ge 0$. (10)

b) Solve the following LPP graphically. Maximize $Z = 100x_1 + 40x_2$ subject to the constraints $5x_1 + 2x_2 \le 1000, 3x_1 + 2x_2 \le 900, x_1 + 2x_2 \le 500, x_1, x_2 \ge 0$. (5)

3 a) Minimize $f(x_1,x_2,x_3) = \frac{1}{2}(x_1^2 + x_2^2 + x_3^2)$ by converting it into single variable function using the constraints $x_1 - x_2 = 0$ and $x_1 + x_2 + x_3 - 1 = 0$. (7)

b) Apply principle of duality to solve the following LPP. Maximize $Z = 40x_1 + 35x_2$ subject to $2x_1 + 3x_2 \le 60, 4x_1 + 3x_2 \le 96, x_1, x_2 \ge 0$. (8)

PART B

Answer any two full questions, each carries 15 marks.

4 a) A transportation cost matrix is given below. Find the optimal solution using MODI method. (8)

	D_1	D_2	D_3	D_4	Supply
O_1	21	16	25	13	11
O_2	17	18	14	23	13
O_3	32	27	18	41	19
Demand	6	10	12	15	

b) Determine an initial basic feasible solution to the following transportation problem using North-West corner rule. (7)

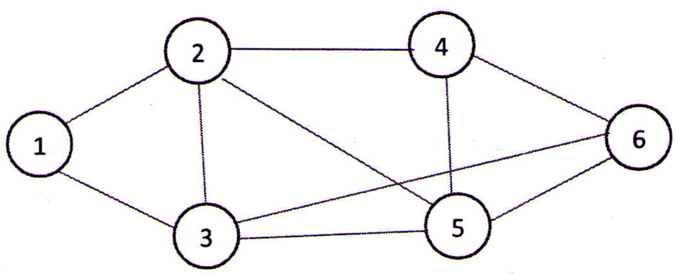
	A	B	C	D	E	Supply
O_1	3	4	6	8	9	20
O_2	2	10	1	5	8	30
O_3	7	11	20	40	3	15
O_4	2	1	9	14	16	13
Demand	40	6	8	18	6	

5 a) Consider the payoff matrix of Player A as shown in the table.Solve it by graphical method to find optimal strategy for A, B and value of game. (8)

Player B

$$\begin{array}{c} \\ \text{Player A} \end{array} \begin{array}{c} \begin{matrix} B_1 & B_2 & B_3 & B_4 & B_5 \end{matrix} \\ \begin{bmatrix} 3 & 0 & 6 & -1 & 7 \\ -1 & 5 & -2 & 2 & 1 \end{bmatrix} \end{array}$$

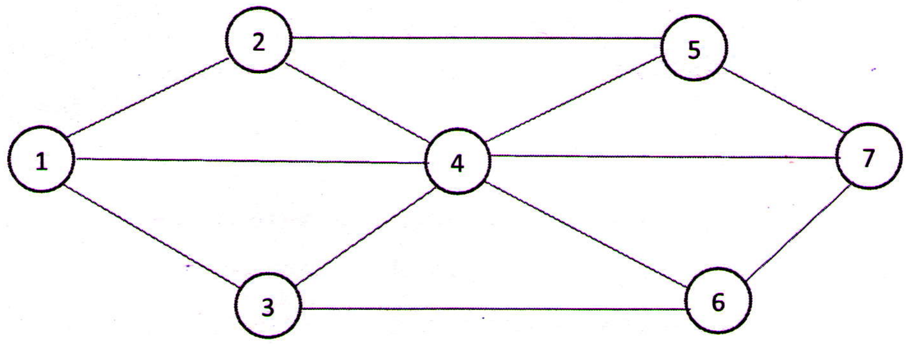
b) A truck must deliver concrete from the ready mix plant to a construction site. The network in figure represents the available routes between the plant and the site. Find the shortest distance from node 1 to node 6 by Dijkstra's method. (7)



6 a) Find the initial basic feasible solution to the following unbalanced transportation Problem using VAM, and test the optimality using MODI method. (8)

	D_1	D_2	D_3	Supply
O_2	15	3	21	30
O_3	18	12	18	240
O_4	9	6	15	45
Demand	225	60	150	

b) Find the minimum spanning tree to the following network by PRIM'S algorithm. (7)



PART C

Answer any two full questions, each carries 20 marks.

7 a) Minimize the function $f(x) = x^5 - 5x^3 - 20x + 5$ by Fibonacci search method in the interval [0, 5], take n=6. (10)

b) Minimize $f(x_1, x_2) = 2x_1^2 + x_2^2$ using steepest descent method with starting point $\begin{pmatrix}1\\2\end{pmatrix}$ in three iterations. (10)

8 a) Illustrate with a diagram the process of recombination in order to obtain solution of the highest quality. (10)

b) Why do we use fitness function? Give generic requirements of the fitness function. (10)

9 a) Apply Hook-Jeeve's method to minimize the function $f(x_1, x_2) = x_1^2 + 3x_2^2 + 6x_1x_2 - x_1 - x_2$ by taking $\Delta x_1 = \Delta x_2 = 0.5$ and starting from the point $\begin{pmatrix}2\\1\end{pmatrix}$. Perform two iterations. (10)

b) Explain the basic operations used in genetic algorithm. (10)

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