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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth Semester B.Tech Degree (S, FE) Examination December 2023 (2015 Scheme)

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 relative minimum in single variable optimisation (5)

b) Find the extreme points of the function f (x, y) = $x^3 + 3y^3 + 3x^2 + 3y^2 + 24$ and determine their nature. (10)

2 a) Discuss the terms uni-modality, convexity. (5)

b) Solve the following LP problem using simplex method. (10)

Maximize $Z = 10X_1+15X_2+20X_3$

Subject to $2X_1+4X_2+6X_3 \leq 24$

$3X_1+9X_2+6X_3 \leq 30$

X_1, X_2 and $X_3 \geq 0$

3 a) A firm manufactures 2 types of products A & B and sells them at a profit of Rs. 2 on type A & Rs. 3 on type B. Each product is processed on 2 machines G & H. Type A requires 1 minute of processing time on G and 2 minutes on H. Type B requires 1 minute on G & 1 minute on H. The machine G is available for not more than 6 hrs. 40 mins per day, while machine H is available for 10 hrs. per day. Formulate the problem as LPP for maximising the profit. (5)

b) State duality property in LPP (3)

c) Determine whether the following function is convex or concave (7)

$f(x_1, x_2, x_3) = 4x_1^2 + 3x_2^2 + 5x_3^2 + 6x_1x_2 + x_1x_3 - 3x_1 - 2x_2 + 15$

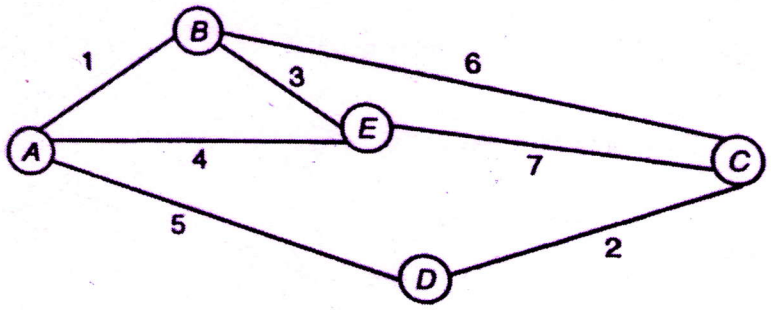
PART B

Answer any two full questions, each carries 15 marks.

4 a) Apply the North-West Corner rule for finding the basic feasible solution of the following transportation problem and hence find optimal solution using MODI method: (15)

Warehouse / Factory	D	E	F	G	Capacity
A	42	48	38	37	160
B	40	49	52	51	150
C	39	38	40	43	190
Requirement	80	90	110	220	500

5 a) Use Dijsktras algorithm, to determine a shortest path from A to C (5)



b) Players A and B plays a game for which payoff matrix with respect to A is given. Apply dominance property and reduce the payoff matrix and hence find the optimal strategies. (10)

		Player B		
		1	2	3
Player A	1	20	-20	50
	2	-25	25	-25
	3	20	-50	50

6 a) Obtain the optimal strategies for both-persons and the value of the game for zero-sum two-person game whose payoff matrix for person A is as follows: (10)

$$\begin{bmatrix} 1 & -3 \\ 3 & 5 \\ -1 & 6 \\ 4 & 1 \\ 2 & 2 \\ -5 & 0 \end{bmatrix}$$

b) Three factories X, Y and Z produce sugar and the capacity of each factory is given below. Factory X produces 5 tons of sugar and Y produces 2 tons of sugar and Z produces 3 tons of sugar. The sugar has demand in four markets A,B,C and D. The demand of market A is 3 tons, that of market B is 3 tons and the demand of market C is 2 tons and D is 2 tons. The following matrix gives the transportation cost of 1 ton of sugar from each factory to the destinations. Find initial solution using Vogel method. (5)

Factories	Cost in Rs. Per ton(×100) Markets				Availability in tons
	A	B	C	D	
X	3	7	6	4	5
Y	2	4	3	2	2
Z	4	3	8	5	3
Requirement in tons	3	3	2	2	$\sum b = 10, \sum d = 10$

PART C

Answer any two full questions, each carries 20 marks.

7 a) Draw the flow chart of Genetic algorithm and explain different stages associated with it (10)

b) Discuss in detail the steps in steepest descent method of multi variable optimisation (5)

c) Define the following terms (i) Cross over (ii) Mutation (5)

8 a) Maximise (20)

$$f(x) = \begin{cases} x/2 & \text{for } x \leq 2 \\ -x+3 & \text{for } x > 2 \end{cases}$$

in the interval (0, 3) , Given N = 6 using Fibonacci search method

9 a) Perform two iterations using Hooke-Jeeve's method to minimise (15)

$$f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$$

starting from the point (0, 0). Take $\Delta x_1 = \Delta x_2 = 0.8$ and $\varepsilon=0.1$

b) Give an example for the application of Genetic algorithm in Electronics Engineering (5)

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