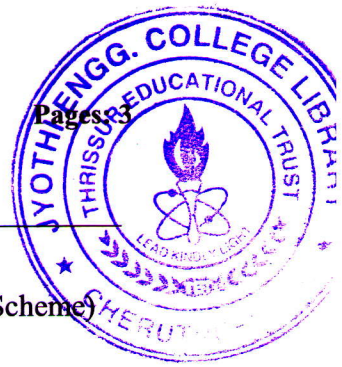


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Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Fifth Semester B.Tech Degree (S,FE) Examination January 2022 (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) Define convex and concave function. Determine whether the following function are convex or concave. (i) $f(x) = e^x$ ii) $f(x) = 8x^2$ (5)
- b) State and prove the necessary and sufficient condition for the relative minimum of a function of a single variable. (10)
- 2 a) Solve using simplex method (8)
Maximise $Z = 5x_1 + 3x_2$ subject to: $x_1 + x_2 \leq 2$, $5x_1 + 2x_2 \leq 10$, $3x_1 + 8x_2 \leq 12$, $x_1, x_2 \geq 0$.
- b) Solve the following problem graphically. Maximise $Z = 60x_1 + 40x_2$ (7)
subject to: $2x_1 + x_2 \leq 60$, $x_1 \leq 25$, $x_2 \leq 35$, $x_1, x_2 \geq 0$
- 3 a) Solve using Dual Simplex method: Minimise $Z = 2x_1 + 2x_2$ (8)
subject to: $2x_1 + 4x_2 \geq 1$, $x_1 + 2x_2 \geq 1$, $2x_1 + x_2 \geq 1$, $x_1, x_2 \geq 0$
- b) Find the extreme points of the function $f(x_1, x_2) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6$. (7)

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

- 4 a) Find the initial basic feasible solution to the following transportation problem using VAM method. (8)

	A	B	C	Supply
1	2	7	4	5
2	3	3	1	8
3	5	4	7	7
4	1	6	2	14
Demand	7	9	18	

- b) Find Basic Feasible Solution using North-West corner rule (7)

	D1	D2	D3	D4	D5	a_i
O1	20	18	18	21	19	100
O2	21	22	23	20	24	125
O3	18	19	21	18	19	175
b_j	60	80	85	105	70	

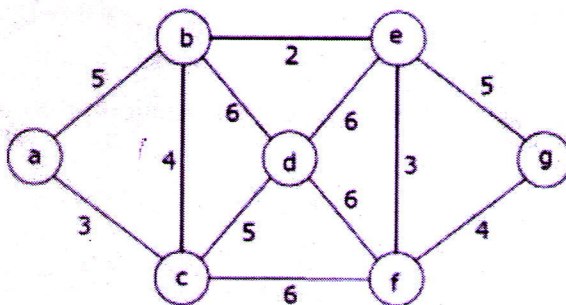
- 5 a) Solve the transportation problem using MODI method (10)

	W1	W2	W3	W4	Supply
P1	190	300	500	100	70
P2	700	300	400	600	90
P3	400	100	600	200	180
Demand	50	80	70	140	

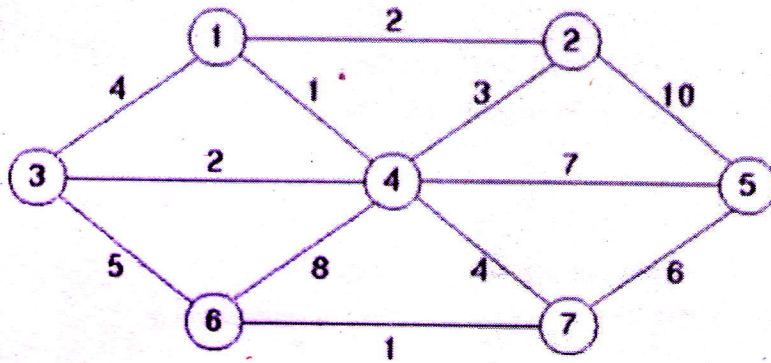
- b) Solve the following game by the principle of dominance (5)

$$\begin{bmatrix} 8 & 10 & 9 & 14 \\ 10 & 11 & 8 & 12 \\ 13 & 12 & 14 & 13 \end{bmatrix}$$

- 6 a) Find the minimum spanning tree to the following network by PRIM'S algorithm. (8)



- b) Solve using Dijkstra's shortest path algorithm taking node 1 to 7 (7)



PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Find the minimum of the function $f(x) = 0.65 - \frac{0.75}{1+x^2} - 0.65x \tan^{-1} \frac{1}{x}$ using Newton Raphson method with the starting point $x_1 = 0.1$. Use $\epsilon = 0.01$ for checking the convergence. (10)
- b) Minimise $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + x_2^2 + 2x_1x_2$ using Steepest Descent method starting from the point $\begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$. (Two Iterations) (10)
- 8 a) Minimise $f(x) = x^2 + \frac{54}{x}$ in the interval $[0,5]$ by the Fibonacci Search Method. (10)
- (Choose $n = 3$).
- b) Define the following terms with suitable applications: (10)
- (i) Cross over (ii) Mutation
- 9 a) Explain the working principle used in Genetic Algorithm. (10)
- b) Derive a fitness function in Genetic algorithms (10)
