Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Examination (Regular and Supplementary), December 2020

Course Code: CE473

Course Name: Advanced Computational Techniques and Optimization

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks. Marks

1 a) Solve the following system of equations using Gauss Elimination method. (10)

$$5x_1 - x_2 = 9$$

$$-x_1 + 5x_2 - x_3 = 4$$

$$-x_2 + 5x_3 = -6$$

b) Explain the general procedure used to formulate and solve optimization problems. (5)

2 a) Find the largest eigen value and eigen vector of the matrix correct to 3 decimal places using Power method. (12)

$$\begin{bmatrix} 4 & 1 & 0 \\ 1 & 20 & 1 \\ 0 & 1 & 4 \end{bmatrix}$$

b) Explain the term Objective function with an example. (3)

3 a) Explain the different types of errors in numerical computation and the rules for estimating these errors. (8)

b) Discuss the advantages, limitations and applications of LP models. (7)

PART B

Answer any two full questions, each carries 15 marks.

4 a) Use Lagrange's interpolation technique to find log_{10} 656. (10)

x	654	658	659	661
$log_{10} x$	2.8156	2.8182	2.8189	2.8202

b) Explain Simplex algorithm. (5)

5 A farmer has 100 acres of land on which he can grow corn, wheat or soyabean. Each acre of corn costs Rs. 100 for preparation, 7 days of manual labour and yields a profit of Rs.30. An acre of wheat costs Rs.120 to prepare, 10 days of (15)

manual labour and yields a profit of Rs. 40. An acre of soyabean costs Rs.70 to prepare, 8 days of manual labour and yields a profit of Rs. 20. If the farmer has Rs.1,00,000 for preparation and can count on 8000 days of manual labour, how many acres should be allocated to each crop to maximise the profit?

6 a) Fit a straight line to the following data using the Method of Least Squares. (10)

x	3.4	4.3	5.4	6.7	8.7	10.6
y	4.5	5.8	6.8	8.1	10.5	12.7

b) Derive the general formula of Newton-Cotes open quadrature. (5)

PART C

Answer any two full questions, each carries 20 marks.

7 a) Solve the equation $\frac{dy}{dx} = \frac{1}{x+y}$ and calculate y (0.1) using fourth order Runge Kutta method. Given $y(0) = 1$ and use h=0.1. (10)

b) Using Taylor series method of fourth order, compute y at $x = 1.1$ and 1.2. Given $\frac{dy}{dx} = x^2 + y^2$ and $y(1) = 2$. (10)

8 a) Use Crank Nicolson's method to solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ satisfying the conditions $u(x, 0) = 0, u(0, t) = 0$ *and* $u(1, t) = 200t$. Compute u for one time step taking $h = \frac{1}{4}$ and $k = \frac{1}{8}$. (10)

b) Solve the equation $\frac{d^2y}{dx^2} = x + y$ for $y(0.25), y(0.5)$and $y(0.75)$ given that $y(0) = y(1) = 0$ using finite difference method. (10)

9 a) Explain the method of steepest descent. (5)

b) Find the minimum of $f = x(x - 1.5)$ by starting from 0 with an initial step size 0.05 by unrestricted search with (i) Fixed step size (ii) Accelerated step size (10)

c) Explain a unimodal function. (5)

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