Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Regular and Supplementary Examination December 2021 (2015 Scheme)

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) Determine the largest Eigen value and the corresponding Eigen vector of the matrix A= (8)

$$\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$$

b) Solve the system of equations (7)

$2x_1 + x_2 + x_3 = 10$

$3x_1 + 2x_2 + 3x_3 = 18$

$x_1 + 4x_2 + 9x_3 = 16$ using Gauss elimination method

2 a) Explain errors in numerical methods. (7)

b) Solve the equations (8)

$2x + y + 6z = 9,$

$8x + 3y + 2z = 13,$

$x + 5y + z = 7$ by Gauss- Seidal Method.

3 a) Explain the formulation of objective function and constraints (8)

b) What are the general optimization procedures? (7)

PART B

Answer any two full questions, each carries 15 marks.

4 a) Evaluate $\int_0^6 \frac{1}{1+x^2} dx$ using Trapezoidal rule and Simpson's 1/3 rd rule. (7)

b) Fit a Power equation $y = ax^b$ to the following data (8)

x	1	2	3	4	5	6
y	2.98	4.26	5.21	6.1	6.8	7.5

5 a) Write the procedure of quadratic spline interpolations. (8)

b) Use multiple linear regression to fit the following data. (7)

x_1	x_2	y
0	0	5
2	1	10
2.5	2	9
1	3	0
4	6	3
7	2	27

6 a) Define the following (6)

i) The standard form of LPP

ii) Artificial variable

iii) Basic solution

b) Use two phase method to (9)

Minimize: $z = x + y$ Subject to

$2x + y \geq 4$

$x + 7y \geq 7$

$x, y \geq 0$

PART C

Answer any two full questions, each carries 20 marks.

7 a) Derive the Diagonal five point formula and standard five point formula (8)

b) Solve the Poisson equation $\nabla^2 u = 8x^2y^2$ for the square mesh $u(x,y) = 0$ on the boundary and mesh length equal to 1.$(0 \leq x \leq 3), (0 \leq y \leq 3)$ (12)

8 a) Using Crank – Nicolson method, solve $u_t = u_{xx}, 0 < x < 1, t > 0$ subject to : (10)

$u(x,0) = 100x(1-x), u(0,t) = 0, u(1,t) = 0$ for one time step. Take $h = 1/4$

b) Form the Taylor series for $y(x)$, find $y(0.1)$ correct to four decimal places if $y(x)$ satisfies $\frac{dy}{dx} = xy + 1, y(0) = 1$ (10)

9 a) Find the minimum of $f(x) = -1.5x + x^2$ by starting from (0,0) with an initial step of 0.05 using (10)

i) Fixed step size method

ii) accelerated step size method

b) Explain the steepest descent method (10)

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