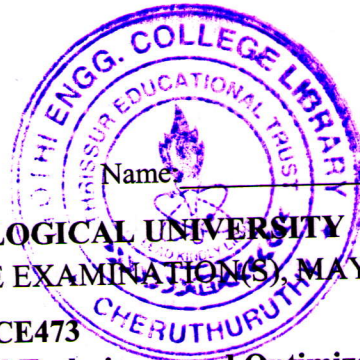


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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATIONS, MAY 2019

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) Explain briefly the errors in numerical methods (8)
 (b) Solve the equation by Gauss elimination method. (7)
 $3x_1 + x_2 + x_3 = 4; x_1 + 4x_2 - x_3 = -5; x_1 + x_2 - 6x_3 = -12$
- 2 (a) Find the largest eigen value and corresponding eigen vector of matrix (15)

$$A = \begin{pmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{pmatrix}$$

- 3 (a) Explain solution, feasible solution, and basic feasible solution of a LPP (9)
 (b) Define slack variable, surplus variable and artificial variables (6)

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

- 4 (a) Derive Newton Cotes open quadrature formula for numerical integration. (5)
 (b) From the following data, calculate $\cos 1.15$ using Lagrange's interpolation formula. (10)

x	1	1.1	1.2
Cos x	0.5403	0.4536	0.3624

- 5 (a) A solid of revolution is formed by rotating about the X axis, the area between the X axis, the lines $x=0$ and $x=1$ and a curve through the points with the following coordinates. (12)

x	0.00	0.25	0.50	0.75	1.00
y	1.0000	0.9896	0.9589	0.9089	0.8415

Estimate the volume of the solid formed using Simpsons's rule.

- (b) What are advantages of spline interpolation from linear interpolations? (3)

- 6 The ABC company has been a producer of picture tubes for television sets and certain printed circuits for radios. The company has just expanded into full scale production and marketing of AM and AM-FM radios. It has built a new plant that can operate 48 hours per week. Production of an AM radio in the new plant will require 2 hours and production of an AM-FM radio will require 3 hours. Each AM radio will contribute Rs. 40 to profits while an AM-FM radio will contribute Rs. 80 to profits. The marketing department after extensive research has determined that a maximum of 15 AM radios and 10 AM-FM radios can be sold each week (15)
- Formulate a linear programming model to determine the optimal production mix of AM-FM radios that will maximise profits.
 - Solve the problem by simplex method.

PART C

Answer any two full questions, each carries 20 marks.

- 7 (a) Find $y(0.1)$, $z(0.1)$ from the system of equations $y' = x+z$, $z' = x-y^2$ given $y(0) = 2$, $z(0) = 1$ using Runge Kutta Method of fourth order (10)
- (b) Use Taylor series method solve $y' = x^2 + y^2$, $y(0) = 0$ for $(0, 0.4)$ using two subintervals of size 0.2 (10)
- 8 (a) Solve the equation $y'' = x + y$ with boundary conditions $y(0) = y(1) = 0$. (10)
- (b) Use Bender Schmidt explicit method to solve $u_t = u_{xx}$ under the conditions $u(0,t) = u(1,t) = 0$ and $u(x,0) = \sin \pi x$, $0 \leq x \leq 1$ (10)
- 9 (a) List 5 techniques of unconstrained optimisation. (5)
- (b) Maximise the function $f(x,y) = 2xy + 2x - x^2 - 2y^2$ with initial guesses $x = 1$ and $y = 1$ using steepest descent method. (15)
