Code No: 121AL

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, August - 2018

MATHEMATICAL METHODS

(Common to EEE, ECE, CSE, EIE, IT, ETM)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A

(25 Marks)

b) Write the normal equations to fit a curve of the form $y = a + bx + cx^{2} \text{ for the data } (x_{i}, y_{i}), i = 1, 2, \dots, n.$ [3]

c) Derive the Newton-Raphson iterative formula to find \sqrt{N} , N > 0. [2] d) Evaluate $\int_{-\infty}^{1} r^3 dx$ using Trapezoidal rule with $h = \frac{1}{4}$. [3]

d) Evaluate $\int_{0}^{1} x^{3} dx$ using Trapezoidal rule with $h = \frac{1}{4}$. [3]

e) Determine the Fourier coefficient a_0 in the Fourier series of $f(x) = |\sin x| \quad \text{in } [-\pi, \pi].$

f) Find the Fourier sine transform of $f(x) = e^{-x}$. [3] g) Obtain a partial differential equation by eliminating the arbitrary function if from

g) Obtain a partial differential equation by eliminating the arbitrary random $z = f(x^2 + y^2)$.

h) Solve pq = z.

i) Find the unit normal vector to the surface $2x^2 + y^2 + 2z = 3$ at (2, 1, -3). [2]

j) State Stoke's theorem.

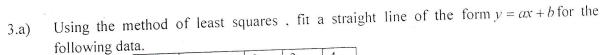
PART-B

(50 Marks)

2.a) Find the cubic polynomial which takes the values y(0) = 1, y(1) = 0, y(2) = 1 and y(3) = 10.

b) Using Lagrange's formula to find y(10) from the data given below. [5+5]

				1.1
\mathbf{x} :	5	6	9	11
	12	13	14	16



y. 1	2	3	4
v: 0	1	1	2
y. 0		4	

Fit a curve of the form $y = ab^x$ to the following data. b)

[5+5]

v.	1	2	3	4
X/:	1	111	35	100

Solve the following system of equations using L-U decomposition method. 2x + 3y + z = 9

$$2x + 3y + z = 9$$

$$x + 2y + 3z = 6$$

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

OR

Find $\frac{dy}{dx}$ at x = 0.1 from the following table.

	100	0.2	0.4	0.6	0.8	1.0
X:	0.0	0.2	0.10	1 10	2.0	3 20
y:	0.0	0.12	0.48	1.10	2.0	13.20

Find an approximate value of y(0.1) for $y' = \frac{y-x}{y+x}$, y(0) = 1 by Euler's method with b) [5+5] h = 0.02.

Obtain the Fourier series for $f(x) = x^2$ in $[-\pi, \pi]$ $1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots = \frac{\pi^2}{12}.$

Find the half range cosine series for the function f(x) = x in $[0, \pi]$. [5+5]b)

Find the Fourier transform of $f(x) = \begin{cases} 1 - x^2, & |x| < 1 \\ 0, & |x| > 1 \end{cases}$ and hence evaluate:

$$\int_{0}^{\infty} \frac{x \cos x - \sin x}{x^3} \cos \left(\frac{x}{2}\right) dx.$$
 [10]

Solve $p + 2q = \tan(y - 2x) + 5z$. 8.a)

b)

Solve $z = px + qy + p^2 + q^2$ by Charpit's method. [5+5]OR

A square plate is bounded by the lines x = 0, y = 0, x = 20 and y = 20 and its Faces are insulated. The temperature along the upper horizontal edge is given by 9. u(x,20) = x(20-x), 0 < x < 20 while other three edges are kept at $0^{\overline{0}}$ C. Find the steady state temperature in the plate.

- 10.a) Find the directional derivative of $f(x, y, z) = x^2 yz + 4xz^2$ at (1, -2, 1) in the direction of the Vector $2\hat{i} \hat{j} 2\hat{k}$.
- b) If $\vec{F} = grad(x^3 + y^3 + z^3 3xyz)$, find $\nabla \cdot \vec{F}$ and $\nabla \times \vec{F}$. [5+5]

OR

- 11. Verify Green's theorem for $\oint_C (x^2 \cosh y) dx + (y + \sin x) dy$, where C is the rectangle with vertices $(0,0), (\pi,0), (\pi,1)$ and (0,1).
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