R13

Code No: 111AL

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year Examinations, October/November - 2016

MATHEMATICAL METHODS

(Common to EEE, ECE, CSE, EIE, BME, 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)

1.a) If h = 1, find $\Delta^2(x^3 - 3x^2)$ [2]

b) Find the particular solution of $(E^2 - 7E + 12)y = 2^n$ [3]

c) Find the interval in which a root of $x\log_{10} x = 1.2$ lie. [2]

d) If $y' = x + y$ and y(0)=1, find $y^{(1)}(x)$ by Picard's method. [3]

e) If $f(x) = x\sin x$ in $(0 \le x \le 2\pi)$, then find a_0 in the Fourier series of *f(x)*. [2]

f) Find the finite Fourier sine transform of f(x) = x^2, $0 < x < \pi$. [3]

g) Form the partial differential equation from $z = (x + a)(y + b)$. [2]

h) Find one integral solution of $(x - y)p + (y - x - z)q = z$. [3]

i) Find $\nabla xy^2 z$. [2]

j) State Green's theorem. [3]

PART-B

(50 Marks)

2.a) Using Gauss backward interpolation formula find y(8) from the following table.

x	0	5	10	15	20	25
y	7	11	14	18	24	32

b) Fit an equation of the form y = ab^x to the following data

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.5

[5+5]

OR

3.a) Use Lagranges formula inversely to obtain the value of t when A = 85 from the following table.

t	2	5	8	14
A	94.8	87.9	81.3	68.7

b) Fit the curve $y = ae^{bx}$ to the following data.

x	0.0	0.5	1.0	1.5	2.0	2.5
y	0.10	0.45	2.15	9.15	40.35	180.75

[5+5]

4. Tabulate the values of y(0.1), and y(0.2) using Taylor series given that $\frac{dy}{dx} = x^2 - y, y(0) = 1.$ Compare with the actual values. [10]

OR

5. Given that $y' = x^2 + y^2,\ y(0) = 1.$ Determine y(0.1) by modified Euler's method.

6. Find the Fourier Transform of $f(x) = \begin{cases} 1 - x^2 & if\ |x| < 1 \\ 0 & if\ |x| > 1 \end{cases}$, Hence evaluate $\int_0^\infty \left[\frac{x\cos x - \sin x}{x^3}\right] \cos\frac{x}{2}\, dx$ [10]

OR

7. Obtain Fourier series for $f(x) = x + x^2$ in $-\pi < x < \pi$ and deduce that $\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$ [10]

8.a) Form the partial differential equation by eliminating the arbitrary function from $xy + yz + zx = f\left(\frac{z}{x+y}\right)$

b) Solve the partial differential equation $(x^2 - yz)p + (y^2 - xz)q = (z^2 - xy)$. [5+5]

OR

9. Solve the boundary value problem $u_{tt} = a^2 u_{xx}\ 0 < x < l,\ t > 0$ with $u(0,t) = 0$, $u(l,t) = 0,\ u(x,0) = 0$ and $u_t\ (x,0) = \sin^3 \frac{\pi x}{l}$ [10]

10. Verify Green's theorem for $\int_c (xy + y^2)dx + x^2 dy$ where c is bounded by $y = x\ and\ y = x^2$. [10]

OR

11. Verify stokes theorem for $\overline{F} = (x^2 + y^2)\bar{i} - 2xy\bar{J}\,\bar{j}$ taken around the rectangle bounded by the lines $x = \pm a, y = 0, y = b.$ [10]

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