Code No: 111AL **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, November/December - 2015
MATHEMATICAL METHODS
(Common to EEE, ECE, CSE, EIE, BME, IT)

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) Evaluate $\delta y_{3/2}$ [2]

b) Solve the difference equation $y_{n+2} + 5y_{n+1} + 6y_n = 0$. [3]

c) Find the interval in which a root of $3x - e^x + \sin x = 0$ lies. [2]

d) If $y' = y - x$ and y(0)=1 , find y(0.2), y(0.4) by Euler's method, taking h = 0.2. [3]

e) If $f(x) = x + x^2$ in $-\pi < x < \pi$ then find the average value of *f(x)* in $(-\pi, \pi)$. [2]

f) If Fourier transform of f(t) = $\frac{1}{s^2+1}$, then find F[f(3t)]. [3]

g) Form the partial differential equation from $z = ax + by + \frac{a}{b}$. [2]

h) Find one integral solution of $xp + yq = x$. [3]

i) Find $\nabla x^3 z$. [2]

j) Show that $\bar{v} = (x+3y)i + (y-3z)j + (x-2z)k$ is solenoidal. [3]

PART-B

(50 Marks)

2.a) Find y(1.6) if y(1.2) = 1.36, y(2.0) = 0.58 and y(2.5) = 0.34, y(3.0)= 0.20 using Lagranges interpolation formula.

b) Fit a straight line to the given data by the method of least squares. [5+5]

x	1	2	3	4	5	6
y	14	33	40	63	76	85

OR

3.a) Use Newton's Backward difference formula to find the area of a circle when the diameter is 105, the area for different values of diameter are given below.

d	80	85	90	95	100
A	5026	5674	6362	7088	7854

b) Obtain a relation of the form $y = a(b)^x$ for the following data by the method of least squares. [5+5]

x	2	3	4	5	6
y	8.3	15.4	33.1	64.2	127.4

4. Find y(0.1) and y(0.2) using Runge Kutta fourth order formula given that $\frac{dy}{dx} = x + x^2 y$ and y (0) = 1. [10]

OR

5. Evaluate $\int_0^1 e^{-x^2} dx$ by dividing the range of integration into 4 equal parts using

a) Trapezoidal rule, b) Simpsons $\frac{1}{3}$ rd rule. [5+5]

6. Find the Fourier sine and cosine Transform of xe^{-ax}. [10]

OR

7.a) Obtain Fourier series for the function given by

$$f(x) = \begin{cases} 1 + \frac{2x}{\pi}, & -\pi \le x \le 0 \\ 1 - \frac{2x}{\pi}, & 0 \le x \le \pi \end{cases}$$

b) Expand $\pi x - x^2$ as a half range sine series in the range $0 \le x \le \pi$. [5+5]

8. Solve the following partial differential equations

a) $x^2 p^2 + y^2 q^2 = z^2$ b) $z(x - y) = x^2 p - y^2 q$. [5+5]

OR

9. Solve the problem of a vibrating string with the following boundary conditions.

a) $y(0,t) = 0$ b) $y(l,t) = 0$

c) $\frac{\partial}{\partial t} y(x,0) = x(x - L), 0 < x < L$

d) $y(x,0) = \begin{cases} x, & 0 < x < \frac{L}{2} \\ L - x, & \frac{L}{2} < x < L \end{cases}$ [10]

10.a) Evaluate $\nabla^2 \log r$ where $r = \sqrt{x^2 + y^2 + x^2}$.

b) Prove that the vector field $\bar{F} = (x^2 + xy^2)i + (y^2 + x^2 y)j$ is conservative and find the scalar potential. [5+5]

OR

11. Verify Green's theorem for $\oint (x^2 - xy^3)dx + (y^2 - 2xy)dy$ where C is the square with vertices $(0,0),(2,0),(2,2),(0,2)$ [10]

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