Code No: 111AL **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B.Tech I Year Examinations, December-2014/January-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) If h = 1, find $\Delta E(x!)$. [2m]

b) Evaluate $\Delta \tan^{-1} x$. [3m]

c) Apply Euler's method to find y(0.2), given that $y' = x + y$, $y(0) = 1$ choosing h=0.2. [2m]

d) Establish the formula to find the square root of a number N by Newton Raphson method. [3m]

e) If finite Fourier sine transform of f is $\frac{2\pi}{n^3}(-1)^{n-1}$ find f(x). [2m]

f) Find the Fourier transform of $f(x) = \begin{cases} e^{ix} & 1 < x < 4 \\ 0, & x < 1, x > 4 \end{cases}$. [3m]

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

h) The three possible solutions of $\frac{\partial^2 u}{\partial t^2} = C^2 \frac{\partial^2 u}{\partial x^2}$ [3m]

are i).....
ii) .....
iii).....

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

j) Find $\nabla(x^2 yz)$. [3m]

Part-B (50 Marks)

2.a) Express the polynomial $x^3 - 2x^2 + x - 1$ in terms of factorial notation:

b) Fit a straight line y= a + bx by least squares method.

x	1	2	3	4	5
y	14	27	40	55	68

OR

3.a) Using Newton's forward interpolation formula find the value of $f(1.6)$

x	1	1.4	1.8	2.2
y	3.49	4.82	5.96	6.5

b) Fit a curve of the form $y = ab^x$ by the method of least squares

x	2	3	4	5	6
y	8.3	15.4	33.1	65.2	127.4

4. Find y(0.2) using Runge Kutta fourth order formula, given that $\frac{dy}{dx} = xy + 1,\ y(0) = 2.$

OR

5 Use Euler's modified formula to find y(0.2), $\frac{dy}{dx} = 2e^x - y$, y(0) = 2, taking h = 0.2.

6.a) Obtain the Fourier series for the function f(x) = $x - x^2$ in -1 < x < 1.

b) Using Fourier integral show that $\int_0^\infty \frac{w \sin xw}{1+w^2} dw = \frac{\pi}{2} e^{-x} \left(x > 0\right).$

OR

7.a) Find the half range cosine series $f(x) = x(2-x)$ in $0 \le x \le 2$ and hence find the sum of series $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \ldots$

b) Find the Fourier Transform of $f(x) = \begin{cases} \cos x & 0 < x < a \\ 0 & x \ge a \end{cases}$.

8. Solve the following partial differential equation $x^2p^2 + y^2q^2 = z^2$.

OR

9. Find the general solution of the wave equation $\frac{\partial^2 u}{\partial t^2} = C^2 \frac{\partial^2 u}{\partial x^2}$.

10. If $\bar{F} = \left(x^2 - y\right)i + \left(2xz - y\right)j + z^2k$ evaluate $\int_c \bar{F}\, d\bar{r}$ straight line joining the points (0,0,0) to (1,2,4).

OR

11. Verify Green's theorem for $\int_C \left(y - \sin x\right)dx + \cos x dy$ where C is the triangle formed the points (0,0); $\left(\frac{\pi}{2}, 0\right)$ and $\left(\frac{\pi}{2}, 1\right)$.

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