Code No: 114DD **R13**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B.Tech II Year II Semester Examinations, May - 2016**
**MATHEMATICS - II**
**(Common to ME, MCT, MIE, MSNT)**

**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) Find $\nabla x^2yz^3$. [2]

b) State Stoke's theorem . [3]

c) If f (x)= $x + x^2$ in $(-\pi, \pi)$ then find $a_0$ in the fourier series of f(x). [2]

d) If the Fourier transform of f(t) = $\frac{2\sin as}{s}$, then find F[ t f(t)] . [3]

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

f) Write the three normal equations to fit $y = a + bx + cx^2$. [3]

g) Find the two points between which the root of $x\log_{10} x = 1.2$ lies. [2]

h) Find the LU decomposition of A = $\begin{bmatrix} 1 & 5 \\ 2 & 3 \end{bmatrix}$. [3]

i) If $\frac{dy}{dx} = 1 + xy$ and y(0)=1then find $y^{(1)}(x)$ by Picard' methods. [2]

j) If $y'' + y = 2$, then find the recurrence relation connecting $y_i$, $y_{i-1}$, $y_{i+1}$ [3]

## PART - B (50 Marks)

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

**OR**

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

4.a) Find the Fourier series of the periodic function as defined by

$$f(x) = \begin{cases} -\pi \text{ in } -\pi < x < 0 \\ x \text{ in } 0 < x < \pi \end{cases}$$

b) Obtain the Fourier cosine transform of [5+5]

$$f(x) = \begin{cases} x, & 0 < x < 1 \\ 2 - x, & 1 < x < 2 \\ 0, & x > 2 \end{cases}$$

**OR**

5.a) Obtain the Fourier series to represent $f(x)=\frac{1}{4}(\pi-x)^2, 0<x<2\pi$

b) Find the fourier transform of $f(x)=\begin{cases}1-|x|, & if\ |x|<1\\ 0 & if\ |x|>1\end{cases}$ [5+5]

6. Fit a natural cubic spline to the following data. Hence determine y(0.5) and y(1.5). [10]

| x | 0 | 1 | 2 |
|---|---|---|---|
| y | 4 | 1 | 2 |

**OR**

7.a) Find y(15), given that y(5)=12, y(6)=13, y(9)=14, y(11)=16 by Lagrange's interpolation formula.

b) Fit the curve y = a + bx. [5+5]

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| y | 1 | 1.8 | 3.3 | 4.5 | 6.3 |

8. Solve the following equations by Gauss seidel method. [10]

6x + y + 2z = 3, x + 8y + z = 8, 2x + 4y + 9z = 9

**OR**

9.a) Find a real root of the equation 3x – 1 = cos x by iterative method.

b) Give the geometric interpretation of Regula Falsi method. [5+5]

10. Find y(0.2)using Taylor's series given that $\frac{dy}{dx}=xy^2+1$ and y(0)=1, taking h=0.2. [10]

**OR**

11. Find the values of $y\left(\frac{\pi}{8}\right)$, $y\left(\frac{\pi}{4}\right)$ and $y\left(\frac{3\pi}{8}\right)$ by finite difference method, given that $y''+y=2$, $y(0)=0$, $y\left(\frac{\pi}{2}\right)=0$. [10]

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