

Code No: 114DD

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 $\nabla x^2 y z^3$. [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 $f(t) = \frac{2 \sin at}{s}$, then find $F[tf(t)]$. [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 $y(0) = 1$ then find $y^{(4)}(x)$ by Picard's 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 $\int_c (xy + y^2) dx + x^2 dy$ where c is bounded by $y = x$ and $y = x^2$. [10]

OR

3. Verify stokes theorem for $F = (x^2 + y^2) i - 2xy j$ 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 $f(x) = \begin{cases} 1-|x|, & \text{if } |x| < 1 \\ 0 & \text{if } |x| > 1 \end{cases}$ [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]

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

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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