

Code No: 114DD

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year II Semester Examinations, October/November - 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 ∇r^2 where $\bar{R} = x\bar{i} + y\bar{j} + 2z\bar{k}$ and $r = |\bar{R}|$. [2]
- b) If $F = (2 + y)\bar{i} + ax\bar{j} + 2z\bar{k}$ is irrotational, then find the value of a [3]
- c) If $f(x) = \begin{cases} -\pi & \text{in } -\pi < x < 0 \\ x & \text{in } 0 < x < \pi \end{cases}$, find a_0 . [2]
- d) If finite fourier cosine transform of f is $\frac{1}{n^2} [(-1)^n - 1]$ and $F_c(0) = \frac{\pi^2}{2}$, Find $f(x)$. [3]
- e) Prove that $\delta E^{1/2} = E - 1$. [2]
- f) Write the three normal equations to fit $y = a + bx + cx^2$ [3]
- g) Find the two values between which the root of $xe^x = 3$ lies. [2]
- h) Find LU decomposition of $\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$. [3]
- i) Given that $\frac{dy}{dx} = e^x - y$, $y(0) = 1$, Find $y^{(1)}(x)$ by Picards method. [2]
- j) If $y'' + 3y' - 4y = -8$, $y(0) = 0, y(1) = 1$ and $h = 0.25$, then find the recurrence relation connecting y_i, y_{i-1}, y_{i+1} [3]

PART - B

(50 Marks)

- 2.a) If $\bar{F} = (5xy - 6x^2)\bar{i} + (2y - 4x)\bar{j}$ evaluate $\int_c \bar{F} \cdot d\bar{r}$ along the curve c in the xy plane $y = x^3$ from the point (1, 1) to (2, 8). [5+5]
- b) Show that $\text{curl}(r^n \bar{r})$, where $r = |\bar{r} = x\bar{i} + y\bar{j} + 2z\bar{k}|$. [5+5]
- OR
3. Verify stoke's theorem for $F = y^2\bar{i} + y\bar{j} - zx\bar{k}$ and S is the upper half of the sphere $x^2 + y^2 + z^2 = a^2$ and $z \geq 0$ [10]
- 4.a) Find a Fourier series to represent $f(x) = x^2$ from $x = -\pi$ to π . Hence show that $\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$
- b) Find f(x) if its sine transform is e^{-ax} . [5+5]

OR

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

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

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.a) Split into partial fractions using Lagranges formula $\frac{x^2 + 2x}{(x-1)(x-2)(x-3)}$.

b) Find the curve of best fit of the type $y = a.e^{bx}$ to the following data by the method of least squares

x	1	5	7	9	12
y	10	15	12	15	21

[5+5]

OR

7.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 a straight line $y = a + bx$ by the method of least squares.

x	0	5	10	15	20	25
y	12	15	17	22	24	30

[5+5]

8.a) Find a real root of $\cos x - x^2 - x = 0$ using Newton Raphsen method.

b) Interpret Regula Falsi method Geometrically.

[5+5]

OR

9. Solve the system of equations using Gauss Seidal method

$$x + 5y + 2z = 7$$

$$7x - y + z = 2$$

$$x + 2y + 5z = 9.$$

[10]

10.a) Find y(0.1) and y(0.2) using Runge Kutta method given that $y' = x^2 - y$, $y(0) = 1$.

b) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$, using Simpson's $\frac{3}{8}$ th rule.

[6+4]

OR

11.a) Find the largest eigen value of $A = \begin{bmatrix} 1 & -1 & 2 \\ 1 & 2 & 5 \\ 1 & 0 & 5 \end{bmatrix}$ using power method.

b) Explain Numerical integration. Geometrically explain Trapezoidal rule.

[6+4]

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