

Code No: 113AA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, March 2017

MATHEMATICS – II

(Common to CE, CHEM, MME, AE, PTE, CEE)

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 $\text{div}(x^2i + xzj - z^3k)$ [2]
- b) State divergence theorem. [3]
- c) If $f(x) = x$ in $(0, 2\pi)$ and $f(x + 2\pi) = f(x)$ then find a_0 in fourier series. [2]
- d) If the fourier cosine tranform of e^{-ax} is $\frac{a}{(s^2 + a^2)}$ then find the fourier sine transform of xe^{-ax} . [3]
- e) If $h = 1$, evaluate $\Delta^2(2x^2 + 3)$. [2]
- f) Find the linear polynomial satisfied by $f(4)=9.5$ and $f(7)=16.5$ by Lagrange's method. [3]
- g) Find two values of x between which the root of $x \log_{10} x = 1.2$ lies. [2]
- h) Find LU decomposition of $A = \begin{bmatrix} 2 & 5 \\ -2 & 0 \end{bmatrix}$. [3]
- i) If $h = 1$, evaluate $\int_0^2 \frac{dx}{(4x+5)}$ by simpson's $\frac{1}{3}$ rd rule. [2]
- j) If $\frac{dy}{dx} = 1 - 2xy$ $y(0) = 0$ then find $y(0.1)$ by Taylor's series method taking upto 2 differentials. [3]

PART-B

(50 Marks)

- 2.a) If $\vec{F} = (x + y + 1)i + j - (x + y)k$, then show that $\vec{F} \text{ curl } \vec{F} = 0$
 - b) Evaluate $\int_C \vec{F} \cdot d\vec{r}$ where $\vec{F} = 3xyi - y^2j$ and C is the parabola $y = 2x^2$ from $(0,0)$ to $(1,2)$. [5+5]
- OR**
3. Verify stokes theorem for $\vec{F} = (x^2 + y^2)i - 2xyj$ taken around the rectangle bounded by the lines $x = \pm a, y = 0, y = b$. [10]

4.a) Obtain the Fourier series for

$$f(x) = \begin{cases} 1, & 0 < x < 1 \\ 2, & 1 < x < 3 \end{cases}$$

and $f(x) = f(x + 3)$.

b) Find the fourier sine transform of e^{-x} and hence evaluate $\int_0^{\infty} \frac{x \sin mx}{1+x^2} dx$. [5+5]

OR

5.a) Obtain cosine series for the function $f(x) = \begin{cases} x, & 0 \leq x \leq \frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2} \leq x \leq \pi \end{cases}$

b) If $\bar{f}(s) = F[f(t)]$, then prove that $F[t^n f(t)] = (-i)^n \frac{d^n \bar{f}(s)}{ds^n}$ [5+5]

6.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) Fit a straight line

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

[5+5]

OR

7. Fit a second degree parabola to the following data using method of least squares. [10]

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

8. Test the consistency of equations $3x + 3y + 2z = 1$, $x + 2y = 4$, $10y + 3z = -2$. Solve them if they are consistent by LU decomposition method. [10]

OR

9.a) Find a real root of the equation $x \sin x + \cos x = 0$, using regula falsi method.

b) Explain the Interpret Newton's method Geometrically. [5+5]

10. Given that $y' = x^2 + y^2$, $y(0) = 1$ determine $y(0.1)$ and $y(0.2)$ by modified Euler's method. [10]

OR

11. Find the values of $y(0.25)$, $y(0.5)$ and $y(0.75)$ by finite difference method, given that, $y''' = 3y' + 2y = 6$, $y(0) = 1$, $y(1) = 1$. [10]

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