Code No: 113AA

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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 $div\left(x^2 i + xzj - z^3 k\right)$ [2]

b) State divergence theorem. [3]

c) If f (x) = x in (0, 2π) and $f\left(x+2\pi\right) = f\left(x\right)$ 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 $\int_0^2 \frac{dx}{(4x+5)}$ b y 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 $\bar{F} = (x+y+1)i + j - (x+y)k$, then show that $\bar{F}$ curl $\bar{F}$ =0

b) Evaluate $\int_C \bar{F}.d\bar{r}$ where $\bar{F} = 3xyi - y^2 j$ and C is the parabola $y = 2x^2$ from $(0,0)$ to $(1,2)$. [5+5]

OR

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

4.a) 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 $f(x)=\begin{cases} x, 0\le x\le \frac{\pi}{2} \\ \pi - x \, , \frac{\pi}{2}\le x\le \pi \end{cases}$

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