

Code No: 123AA

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, March - 2017

MATHEMATICS – II

(Common to CE, MME, AE, CEE, PTM)

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 the greatest value of the directional derivative of the function $f = x^2 y z^3$ at $(2, 1, -1)$. [2]

b) $\vec{f} = r^n \vec{r}$. Find 'n' if \vec{f} is solenoidal. [3]

c) Find the Fourier series of $f(x) = x$ in $(-\pi, \pi)$, $f(x+2\pi) = f(x)$. [2]

d) Find the Fourier sine and cosine transforms of $f(x) = \begin{cases} 1, & 0 \leq x < a \\ 0, & x \geq a \end{cases}$. [3]

e) Write the normal equations to fit the power curve $y = ab^x$. [2]

f) Form the forward difference table for the following data: [3]

x	0	1	2	3
F(x)	1	3	7	13

g) Given that

x:	10	15	20
F(x):	19.97	21.51	22.47

then find $\Delta^2 f(10)$. [2]

h) Find the positive root of the equation $f(x) = x^3 - 2x - 5 = 0$ that lies between 2 and 3 using Regular falsi method. [3]

i) Evaluate $\int_0^1 \frac{1}{1+x} dx$ by Trapezoidal rule. [2]

j) If $A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$ then find the eigen values of $A^2 - A + 3I$. [3]

PART-B

(50 Marks)

2.a) Find the directional derivative of $2xy + z^2$ at $(1, -1, 3)$ in the direction of $\bar{i} + 2\bar{j} + 3\bar{k}$.

b) Find constants a, b and c if the vector

$$\bar{f} = (2x + 3y + az)\bar{i} + (bx + 2y + 3z)\bar{j} + (2x + cy + 3z)\bar{k} \text{ is irrotational.} \quad [5+5]$$

OR

3.a) Apply divergence theorem to evaluate $\iiint_s (x+z)dydz + (y+z)dzdx + (x+y)dxdy$ Where 's' is the surface of the sphere $x^2 + y^2 + z^2 = 4$.

b) Evaluate by Green's theorem $(y - \sin x)dx + \cos x dy$ Where 'C' is the triangle enclosed by the lines $y=0$, $x = \pi/2$, $\pi y = 2x$. [5+5]

4.a) Expand $f(x) = e^{ax}$ in a Fourier series in $0 < x < 2\pi$, $f(2\pi + x) = f(x)$.

b) Find the Fourier series and representation the function $f(x) = \sin x$, $-\pi < x < \pi$, $f(2\pi + x) = f(x)$. [5+5]

OR

5.a) Find the Fourier transform of $f(x) = \begin{cases} x, & -1 < x < 1 \\ 0, & \text{otherwise} \end{cases}$

b) Evaluate $\int_0^\infty \frac{x^2}{(a^2 + x^2)^2} dx$ ($a > 0$) using parseval's identity. [5+5]

6.a) From the following table values of x and $y = e^x$ interpolate values of y when $x = 1.91$

X:	1.7	1.8	1.9	2	2.1	2.2
e^x	5.4739	6.0496	6.6859	7.3891	8.1662	9.0250

b) Find the interpolating polynomial of f(x) from the table. [5+5]

X:	0	1	4	5
F(x)	4	3	24	39

OR

7.a) Fit a straight line to the following data

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

b) Fit a second degree polynomial to the following data by the method of least squares. [5+5]

x	10	12	15	23	20
y	14	17	23	25	21

8.a) Find out the square root of 25 given $x_0 = 2.0$, $x_1 = 7.0$ using Bisection method.

b) Using Newton-Raphson method find square root of $N=24$. [5+5]

OR

9.a) Solve the equations $2x + 3y + z = 9$, $x + 2y + 3z = 6$, $3x + y + 2z = 8$ by LU decomposition method

b) Starting with $(x_0, y_0, z_0) = (0, 0, 0)$ and using Jacobi method, find the next five iterations for the system $5x + y + z = 10$, $2x + 8y - z = 11$, $-x + y + 4z = 3$. [5+5]

10. Evaluate $\int_0^4 e^x dx$ using Trapezoidal and Simpson's 1/3 rule. Also compare your result with the exact value of the integral and justify the result. [10]

OR

11. Using modified Euler method find $y(0.2)$ and $y(0.4)$ given $y' = y + e^x$ $y(0)=0$. [10]

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