R13

Code No: 111AL

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B.Tech I Year Examinations, June - 2015
MATHEMATICAL METHODS
(Common to EEE, ECE, CSE, EIE, IT)

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) Prove that $\nabla E = \Delta$ [2M]

b) Given that y(0)=2, y(1)=2, y(3) =6 Find the linear polynomials in (0, 1) and (1, 3) by Lagranges interpolation formula. [3M]

c) Find the two points of which in between the root of $x\sin x + \cos x = 0$. [2M]

d) If $\frac{dy}{dx} = x + y$, y(0) = 2 then find y(0.1) and y(0.2)by Euler's method. [3M]

e) If $f(x) = \begin{matrix} 0, & -\pi < x < 0 \\ \sin x, & 0 < x < \pi \end{matrix}$ then find a_0 in the Fourier serried of f(x). [2M]

f) If finite Fourier sine transform of f is $\frac{2\pi}{n^3}(-1)^{n-1}$ then find f(x). [3M]

g) Form the partial differential equation from $z = a + b(x + y)$. [2M]

h) Write the three possible solutions of $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$. [3M]

i) Find $\nabla(x^2 + y^2 z)$. [2M]

j) If $\overline{F} = xi - y^2 j + z^3 k$, find curl $\overline{F}$ [3M]

PART-B

(50 Marks)

2.a) If $y_0 = 5, y_1 = 8, y_2 = 13, y_3 = 20$. Assuming the third differences are zero find y_4 and y_5.

b) Fit a straight line to the following data using the method of least squares.

x	1	3	7	9	11	13
y	3.4900	8.6900	19.0900	24.2900	29.4900	34.6900

[5+5]

OR

3.a) Find y(3.4) from the following table using Newton's forward interpolation formula:

x	3	4	5	6
y	31	69	131	223

b) Fit a straight line to the following data using the method of least squares. [5+5]

x	1	2	3	4	5	6
y	14	33	40	63	76	85

4. Evaluate $\int_0^{\pi} \sin x \, dx$ by dividing the range into 10 equal parts using

a) Trapezoidal rule, b) Simpson's $\frac{1}{3}$rd rule. [5+5]

OR

5. Find y(0.2) using Taylor's series method given that $\frac{dy}{dx} = 1 - 2xy$, y(0) = 0 taking h = 0.1. [10]

6.a) Obtain half range cosine series for $\sin x$ in $(0, \pi)$.

b) If the fourier cosine transform of f(t) is $f_c(s)$, then prove that the Fourier sine transform of tf(t) is $(-f_c'(s))$. [5+5]

OR

7.a) Obtain Fourier series for $f(x) = x^3$ in [- 1, 1].

b) Find f(x), if its sine transform is e^{-as}. [5+5]

8. Solve the partial differential equation $px + qy = pq$ by Charpit's method. [10]

OR

9. Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial u^2}{\partial x^2}$ with boundary conditions $u(x,0) = 3\sin n\pi x$ $u(0,t) = 0, u(1,t) = 0 \quad 0 < x < 1, \ t > 0$. [10]

10.a) Find the directional derivative of $\phi = x^2yz + 4xz^2$ at (1,-2-1) in the direction of $2i - \bar{j} - 2\bar{k}$.

b) Evaluate $\int_c \bar{F} \cdot \bar{dr}$ where $\bar{F} = x^2 i + y^2 j$ and c is the curve $y = x^2$ in the xy-plane from (0, 0) to (1, 1). [5+5]

OR

11. Verify divergence theorem for the function $\bar{F} = yi + xj + z^2 k$ taken over the cylindrical region bounded by $x^2 + y^2 = 9, z = 0$ *and* $z = 2$. [10]

---ooOoo---