Code No:131AA **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B .Tech I Year I Semester Examinations, December - 2018
MATHEMATICS-I
(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, ETM, MMT, AE, MIE, PTM, CEE, 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) Solve : ydx – xdy = a ($x^2 + y^2$)dx [2]

b) Solve : $(D^4 - 2D^3 - 3D^2 + 4D + 4)y = 0,\ where\ D = \frac{d}{dt}$. [3]

c) If $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$ then find the rank of A [2]

d) Reduce the following matrix to upper triangular form (Echelon form) by elementary row transformations. $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 7 \\ 3 & 1 & 2 \end{bmatrix}$ [3]

e) Find the Characteristic roots of the matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ [2]

f) Find the Quadratic form corresponding to the matrix $\begin{bmatrix} 1 & 2 & 5 \\ 2 & 0 & 3 \\ 5 & 3 & 4 \end{bmatrix}$ [3]

g) If $z = f(x + ct) + \emptyset\left(x - ct\right)$ then show that $\frac{\partial^2 z}{\partial t^2} = c^2 \frac{\partial^2 z}{\partial x^2}$ [2]

h) If u = $\cos^{-1}\frac{x+y}{\sqrt{x}+\sqrt{y}}$ then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = -\frac{1}{2}\cot u$ [3]

i) Find a Partial differential equation by Eliminating arbitrary function f from $z = f(x^2 - y^2)$ [2]

j) Solve : $p\tan x + q\tan y = \tan z$ [3]

PART – B

(50 Marks)

2. Apply the method of variation of parameters to solve $\frac{d^2y}{dx^2} + y = \tan x$ [10]

OR

3. Solve the equation $L\frac{di}{dt} + Ri = E_o \sin \omega t$ where L, R and E_o are constants and discuss the case when t increases indefinitely. [10]

4. Determine the rank of the matrix $A = \begin{pmatrix} 0 & 2 & 3 & 4 \\ 2 & 3 & 5 & 4 \\ 4 & 8 & 13 & 12 \\ 6 & 13 & 21 & 20 \end{pmatrix}$ by reducing to echelon from. [10]

OR

5. Solve the system of equations $4x + y + z = 4, x + 4y - 2z = 4, 3x + 2y - 4z = 6$ by LU - Decomposition method. [10]

6. Verify Cayley-Hamilton theorem for the matrix $A = \begin{pmatrix} 2 & 1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$ and hence find A^{-1} and A^4 [10]

OR

7. Reduce the quadratic form $Q = {x_1}^2 + 3{x_2}^2 + 3{x_3}^2 - 2x_2x_3$ to the canonical form and hence find its index and signature. [10]

8. If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, show that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2$ u $= -\frac{9}{(x+y+z)2}$.[10]

OR

9. Using Taylor's series expand $f(x, y) = e^y \log(1 + x)$ in powers of x and y . [10]

10.a) Solve: $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$

b) Solve: $p + 3q = 5z + \tan(y - 3x)$ [5+5]

OR

11.a) Find a Partial differential equation by eliminating the arbitrary function $\emptyset\ from$ $\emptyset\,(x^2 + y^2 + z^2,\ z^2 - 2xy) = 0$.

b) Solve $xp + yq = z$. [6+4]

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