

Roll No.

Total No. of Pages : 02

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**B.Tech.(CSE/IOT/AI&ML/DS/Internet of Things and Cyber Security
including Block Chain Technology) (Sem.-3)**

MATHEMATICS-III

Subject Code : BTAM304-18

M.Code : 76438

Date of Examination : 23-12-2023

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Solve the following :

a) State Euler's theorem

b) If $z = \log(x^2 + xy + y^2)$, Prove that $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = 2$.

c) State Gauss Test

d) State Cauchy's root test

e) Test the convergence of the series $\sum \frac{(-1)^{n-1}}{n}$

f) Evaluate $\int_1^2 \int_1^3 dx dy$

g) Evaluate $x \frac{dy}{dx} - y - 2x^3 = 0$

h) Evaluate $\frac{dy}{dx} + \frac{y}{x^2} = x, (x > 0)$

i) Solve $(y - xp)(p - 1) = p$

j) If $x = r \cos \theta, y = r \sin \theta$, find $\frac{\partial(x, y)}{\partial(r, \theta)}$.

SECTION-B

2. If $V = r^m$ where $r^2 = x^2 + y^2 + z^2$, show that $\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} + \frac{\partial^2 V}{\partial z^2} = m(m+1)r^{m-2}$.
3. Test the convergence or divergence of the series
$$\frac{2}{1^2}x + \frac{3^2 x^2}{2^3} + \frac{4^3 x^3}{3^4} + \text{-----} \infty.$$
4. Solve the differential equation $(3xy^2 - y^3) dx - (2x^2 y - xy^2) dy = 0$.
5. Change the order of integration and hence evaluate $\int_0^\infty \int_0^x x e^{-\frac{x^2}{y}} dy dx$.
6. Apply the method of variation of parameters to solve $\frac{d^2 y}{dx^2} - 6 \frac{dy}{dx} + 9y = \frac{e^{3x}}{x^2}$.

SECTION-C

7. The temperature 'T' at any point (x, y, z) in space $400xyz^2$. Find the highest temperature on surface of unit $x^2 + y^2 + z^2 = 1$.
8. a) Solve $y - 2px = \tan^{-1}(xp^2)$
b) Evaluate $\frac{dy}{dx} - \frac{dx}{dy} = \frac{x}{y} - \frac{y}{x}$.
9. Solve the differential equation $x^2 \frac{d^2 y}{dx^2} - 3x \frac{dy}{dx} + y = \frac{\log x \sin(\log x) + 1}{x}$.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.