

Roll No.

Total No. of Pages : 02

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

MATHEMATICS-III

Subject Code : BTAM304-18

M.Code : 76438

Date of Examination : 01-06-2023

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. Write Briefly :

- Examine for saddle points $f(x,y) = xy$.
- Change order of integration for $\int_{y=0}^1 \int_{x=y^2}^{\sqrt{y}} f(x,y) dx dy$.
- Prove that convergent sequence has a unique limit.
- Discuss convergence of $\sum \frac{2n^2 - 2}{2^n + 1}$.
- State Cauchy integral test.
- Prove that if $M(x,y)dx + N(x,y)dy = 0$ is exact then $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$.
- Define Bernoulli's equation.
- Solve $(D^3 + D)y = 0$.

i) Define Legendre's differential equation

j) Solve $(x-1)^2 y'' - (x-1)y' + y = 0$.

SECTION-B

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

3. Test for convergence the series $\sum \frac{n!}{(n+1)^n} x^n$.

4. Discuss uniform convergence of $\sum \frac{a^n x^n}{n^2 + 1}$.

5. Solve $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0$.

6. Using the method of variation of parameters, solve $\frac{d^2y}{dx^2} + y = \tan x$.

SECTION-C

7. Find the volume bounded by the paraboloid $x^2 + y^2 = az$, the cylinder $x^2 + y^2 = 2ay$ and the plane $z = 0$.

8. Solve $\frac{dy}{dx} - \frac{dx}{dy} = \frac{x}{y} - \frac{y}{x}$.

9. Solve $\frac{d^2y}{dx^2} + \frac{1}{x} \frac{dy}{dx} = 12 \frac{\log x}{x^2}$.

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.