

Roll No.

Total No. of Pages : 02

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B.Tech.(IT) (Sem.-3)

MATHEMATICS-III

Subject Code : BTAM-304-18

M.Code : 76393

Date of Examination : 29-12-2023

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. Write briefly :

a) Define Composite function.

b) State Raabe's test.

c) Evaluate $\int_{-1}^2 \int_{-1}^3 x \, dx \, dy$.

d) State Leibnitz test.

e) Test the convergence of the series $\sum_{n=1}^{\infty} \frac{1}{n} \sin \frac{1}{n}$.

f) Solve $\sin(px - y) = p$.

g) If $u = \sin \frac{x}{y}$, $x = e^t$, $y = t^2$, Find $\frac{du}{dt}$.

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

i) Solve $(x^2 + y^2 + e^x) dx + 2xy dy$.

j) Find the general solution of $(D^3 + 1)y = 0$.

SECTION-B

2. If $\theta = t^n e^{\frac{-r^2}{4t}}$, find the value of n which will make $\frac{1}{r^2} \frac{\partial}{\partial r} \left(r^2 \frac{\partial \theta}{\partial r} \right) = \frac{\partial \theta}{\partial t}$.

3. Test the convergence or divergence of the series

$$x + \frac{2^2 x^2}{2!} + \frac{3^3 x^3}{3!} + \dots \dots \dots \infty$$

4. Solve the differential equation $(xy^2 + 2x^2y^3) dx + (x^2y - x^3y^2) dy = 0$.

5. Change the order of integration and hence evaluate $\int_0^a \int_{\frac{y^2}{a}}^y \frac{y dx dy}{(a-x)\sqrt{ax-y^2}}$.

6. Apply the method of variation of parameters to solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = e^x \tan x$.

SECTION-C

7. Use Lagrange's method to find the minimum value of $x^2 + y^2 + z^2$ subject to the conditions

$$x + y + z = 1 \text{ and } xyz + 1 = 0$$

8. a) Solve the differential equation $(xy^3 + y) dx + 2(x^2y^2 + x + y^4) dy = 0$.

b) Solve $x - py = ap^2$

9. Solve the differential equation $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + y = (1-x)^{-2}$.

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.