Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(IT) (Sem–3)

MATHEMATICS-III

Subject Code : BTAM-304-18

M.Code : 76393

Date of Examination : 29-05-2023

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) Examine continuity of $f(x, y) = \dfrac{x^3 - y^3}{x^2 + y^2}$, $(x, y) \neq 0$ at (0, 0).

$$0,(x,y) = 0$$

b) If $u = e^{ax+by} f(ax - by)$, prove that $b \dfrac{\partial u}{\partial x} + \alpha \dfrac{\partial u}{\partial y} + a = 2abu$.

c) State Bolzano-Weirstrass theorem.

d) If $\sum a_n$ an is convergent then prove that $a_n \to 0$ as $n \to \infty$.

e) State Leibnitz test for alternating series.

f) Define exact differential equation. Also give necessary condition for differential equation $M(x, y)dx + N_{(x, y)}dy = 0$ to be exact.

g) Define Clairaut's equation.

h) Define higher order homogeneous and non-homogeneous ordinary linear differential equations.

i) Solve $(D^4 - 4)y = 0$.

j) Solve $(2x + 3)^2 y'' + (2x + 3)y' + y = 0$.

SECTION-B

2. Prove that the rectangular solid of maximum volume which can be inscribed in a sphere is a cube.

3. Discuss convergence of $\{a_n\}$, where $a_n = 1 + \frac{1}{2} + \frac{1}{3} + \ldots\ldots\ldots + \frac{1}{n}$.

4. Discuss the convergence of the series $\sum_{n=1}^{\infty} \frac{n^n x^n}{n!}$.

5. Solve $\frac{dz}{dx} + \frac{z}{x} \log z = \frac{z}{x} (\log z)^2$.

6. Solve the method of variation of parameters $y'' - 2y' + y = e^x \log x$.

SECTION-C

7. Evaluate $\iint_R (x+y)^2 \, dxdy$, where R is the parallelogram in the xy–plane with vertices (1,0), (3,1), (2,2), (0,1) using the transformations $u = x + y$ and $v = x–2y$.

8. Solve $p^2 + 2py \cot x = y^2$.

9. Solve $x^2 \frac{d^2y}{dx^2} + 4x \frac{dy}{dx} + 2y = e^x$.

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.