

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

$$f(0,0) = 0$$

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

c) State Bolzano-Weirstrass theorem.

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

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 $a_n = 1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n}$.
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 $\iint_R (x+y)^2 dx dy$, 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 $x^2 \frac{d^2 y}{dx^2} + 4x \frac{dy}{dx} + 2y = e^x$.

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.