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

Total No. of Questions : 09

B.Tech.(IT) (2018 Batch) (Sem.–3)

MATHEMATICS-III

Subject Code : BTAM-301-18

M.Code : 76393

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) Show that the function $f(x, y) = \dfrac{2x^2y}{x^4 + y^2}$ has no limit as (x, y) approaches $(0, 0)$.

b) Find the local extreme values of the function $f(x, y) = x^3 - y^3 - 2xy + 6$.

c) Sketch the region of integration for the integral

$$\int_0^{\sin x} \int_0^{y} y \, dy dx$$

and write an integral with the order of integration reversed.

d) Define convergence of a series and give an example of a convergent series.

e) Explain the limit comparison test.

f) By inspection obtain the integrating factor and solve the differential equation :

$$x dx = y dy + 2(x^2 + y^2)\, dx = 0$$

g) Check whether the following differential equation exact.

$$(2x + e^y)\, dx + xe^y dy = 0$$

h) Find the general solution of the differential equation $y'' + 2y' + y = 0$

i) Verify whether the linear combination of e^{x} and e^{-2x} is a solution of the differential equation

$$y'' + y' - 2y = 0$$

j) Find the Wronskian of the functions x, x^2 and x^3.

SECTION-B

2. Solve the following integral

$$\int_0^{\ln 2} \int_0^{\sqrt{(\ln 2)^2 - y^2}} e^{\sqrt{x^2+y^2}}\, dx dy$$

by converting it into an equivalent polar integral.

3. For what values of x does the following power series converge ?

$$\sum_{n=1}^{\infty} (-1)^{n-1} \frac{x^n}{n}$$

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

5. Solve the differential equation $y'' + 4y' + 4y = e^{-2x} \sin x$ by using method of variation of parameters.

6. Check the convergence of the following series

(i) $\sum_{n=1}^{\infty} \frac{(2n)!}{n!n!}$ (ii) $\sum_{n=2}^{\infty} \frac{1}{\sqrt{n} \ln n}$

SECTION-C

7. a) Find the maximum and minimum values of the function $f(x, y) = 3x + 4y$ on the circle $x^2 + y^2 = 1$.

b) Find the volume in the first octant bounded by the coordinate planes and the surface $z = 4 - x^2 - y$.

8. State and prove Leibniz's test for alternating series.

9. Find the general solution of the equation $x^3y''' - 3xy' + 3y = 16x + 9x^2 \ln x$.

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.