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Total No. of Pages : 03

Total No. of Questions : 18

B.Tech. (CSE) (2018 Batch) (Sem.-3)

**MATHEMATICS-III**

Subject Code : BTAM304-18

M.Code : 76438

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**

Solve the following :

1. Show that the limit for the function  $f(x, y) = \frac{2x - y}{2x + y}$  does not exist as  $(x, y) \rightarrow (0, 0)$ .
2. Evaluate the integral  $\int_0^1 \int_0^x e^{y/x} dy dx$
3. Check the convergence of the following sequences whose  $n$ th term is given by 
$$a_n = \frac{n}{n^2 + 1}$$
4. State Leibnitz test for convergence of an alternating series  $x = \frac{\pi}{2}$
5. Write down the Taylor's series expansion for  $\cos x$  about  $x = \frac{\pi}{2}$ .
6. Solve by reducing into Clairaut's equation:  $y = px + p^2$ , where  $p = \frac{dy}{dx}$
7. Solve the differential equation  $\frac{dy}{dx} + y = x$

8. Determine whether the differential equation is exact, if found exact solve it.

$$(x^2 + y^2) dx + 2xydy = 0$$

9. Solve the differential equation  $16\frac{d^2y}{dx^2} - 8\frac{dy}{dx} + 5y = 0$

10. Find Particular solution of the differential equation :

$$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = e^{3x}$$

### SECTION-B

11. Find the maximum and minimum distance of the point (1, 2, -1) from the sphere  $x^2 + y^2 + z^2 = 24$ .

12. Evaluate  $\iint_D e^{-(x^2+y^2)} dydx$ , where D is the region bounded  $x^2 + y^2 = 1$

13. For what value(s) of  $x$  does the series converge (i) conditionally (ii) absolutely?

$$x - \frac{x^2}{2} + \frac{x^3}{3} - \dots \text{to } \infty. \text{ Also find the interval of convergence.}$$

14. Solve the differential equation by finding integrating factor

$$(xy + 1) ydx + x(1 + xy + x^2y^2)dy = 0$$

15. Solve the differential equation  $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = xe^{3x} + \sin 2x$

### SECTION-C

16. a) Show that the series  $\sum_{n=1}^{\infty} \frac{1}{n^p}$  converges for  $p > 1$  and diverges for  $0 < p \leq 1$ .

- b) Using double integration, find the area bounded between the parabolas  $y^2 = 4ax$  and  $x^2 = 4ay$ .

17. a) Solve the Bernoulli's equation  $\frac{dy}{dx} + \frac{y}{x} = \frac{y}{x^2}$

b) Solve the differential equation  $xp^2 - 2yp + x = 0$ , where  $p = \frac{dy}{dx}$

18. a) Solve by Method of Variation of parameters

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

b) Find the complete solution of  $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = e^{2x} \sin 2x$

**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.**