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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  $f(x,y) = \frac{x^2 - y^2}{x^2 + y^2}$  does not exist as  $(x, y) \rightarrow (0, 0)$ .
2. Evaluate the integral  $\int_0^1 \int_0^z \int_{x/z}^{x/z} dy dx dz$ .
3. Check the convergence of the following sequences whose nth term is given by  $a_n = \frac{(n+1)^n}{n!}$ .
4. State Cauchy Integral test for convergence of a positive term infinite series.
5. Write down the Taylor's series expansion for  $\sin x$  about  $x = \frac{\pi}{2}$ .
6. Solve by reducing into Clairaut's equation :  $p = \log(px - y)$ , where  $p = \frac{dy}{dx}$ .
7. Solve the differential equation  $\frac{dy}{dx} = y \cot x + x \operatorname{cosec} x$
8. Determine whether the differential equation is exact

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

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

10. Find Particular integral for  $\frac{d^2 y}{dx^2} + 2 \frac{dy}{dx} + y = e^{-x}$

### SECTION-B

11. Using Method of Lagrange Multipliers, find the maximum and minimum distance of the point (3, 4, 12) from the sphere  $x^2 + y^2 + z^2 = 1$ .

12. Solve by changing order of integration :  $\int_0^a \int_y^a \frac{x}{x^2 + y^2} dx dy$ , a is any positive constant.

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

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

14. Solve the differential equation :

$(xy^3 + y)dx + 2(x^2y^2 + x + y^2)dy = 0$

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

### SECTION-C

16. a) Check the convergence of the series  $\sum_{n=2}^{\infty} \frac{\sqrt{n-1} + \sqrt{n}}{n^{3/2}}$ .

b) Find by double integration, the area lying inside the circle  $r = a \sin \theta$  and outside the cardioid  $r = a(1 - \cos \theta)$ .

17. a) Solve the differential equation  $\frac{dy}{dx} + \frac{x}{1-x^2} y = x\sqrt{y}$ .
- b) Solve the differential  $xy p^2 - (x^2 + y^2) p + xy = 0$ , where  $p = \frac{dy}{dx}$ .
18. a) Solve by Method of Variation of parameters  $\frac{d^2 y}{dx^2} + y = \sec x$ .
- b) Solve  $(1+x)^2 \frac{d^2 y}{dx^2} + (1-x) \frac{dy}{dx} + y = \cos \ln(1+x)$ .

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