

Roll No. 

--	--	--	--	--	--	--	--	--	--	--	--

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  $\int_{-1}^1 \int_0^z \int_{x-z}^{x+z} dy dx dz$ .
3. Check the convergence of the following sequences whose  $n$ th term is given by  $a_n = \left( \frac{3n+1}{3n-1} \right)^n$ .
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?

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

14. Solve the differential equation :

$$(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0$$

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  $(1+x)^2 \frac{d^2 y}{dx^2} + (1+x) \frac{dy}{dx} + y = \cos \ln(1+x)$ .

**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.**

**Roll No.**

**Total No. of Pages : 02**

**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) Evaluate the limit for the function  $f(x, y) = \frac{2x-y}{2x+y}$  if exists as  $(x, y) \rightarrow (0, 0)$
- 2) Evaluate the integral  $\int_0^1 \int_{y^2}^{1-y} \int_0^{1-x} x dz dx dy$
- 3) Check the convergence of the following sequences whose nth term is given by  $a_n = \frac{n^2+1}{n^2-1}$
- 4) State Leibnitz test for convergence of an alternating series.
- 5) Write down the Taylor's series expansion for  $\ln(1+x)$  about  $x=0$ .
- 6) Define Clairaut's equation and obtain its general solution.
- 7) Solve the differential equation  $\frac{dy}{dx} - y \tan x = 3e^{-\sin x}$
- 8) Define Exact differential equation and obtain the necessary condition for  $M(x, y) dx + N(x, y) dy = 0$  to be exact.
- 9) Solve the differential equation  $\frac{d^2y}{dx^2} - 14\frac{dy}{dx} + 49y = 0$
- 10) Find particular integral for  $\frac{d^2y}{dx^2} + y = x^2$

### SECTION-B

11) Find the minimum value of the function  $x^2 + y^2 + z^2$  subjected to  $x + y + z = 3a$ .

12) Evaluate  $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dy dx$ , by changing into polar coordinates.

13) Discuss the convergence of the series :  $\frac{1^2}{4^2} + \frac{1^2 5^2}{4^2 8^2} + \frac{1^2 5^2 9^2}{4^2 8^2 12^2} + \dots$  to  $\infty$

14) Solve the differential equation :

$$(xy^2 - e^{\frac{1}{x^3}}) dx - x^2 y dy = 0$$

15) Solve the differential equation  $\frac{d^2 y}{dx^2} - 6 \frac{dy}{dx} + 13y = e^{3x} \sin 4x$

### SECTION-C

16) a) Find the interval of convergence for the infinite series :  $x - \frac{x^3}{3} + \frac{x^5}{5} - \dots$  to  $\infty$ .

b) Find the area bounded by the parabola  $y = x^2$  and line  $y = 2x + 3$

17) a) Solve the differential equation  $\frac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$ .

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

18) a) Apply method of variation of parameters to solve  $\frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} + 2y = e^x \tan x$ ,

b) Solve  $x^2 \frac{d^2 y}{dx^2} - 3x \frac{dy}{dx} + 5y = \sin(\ln x)$

**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.**

Roll No.

**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.**