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 $f(x,y)=\dfrac{x^2+y^2}{x^2-y^2}$ does not exists as $(x, y) \to (0, 0)$.

2. Evaluate the integral $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z} dydxdz$.

3. Check the convergence of the following sequences whose nth term is given by $a_n=\left(\dfrac{3n+1}{3n-1}\right)^n$.

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 $x=\dfrac{\pi}{2}$.

6. Solve by reducing into Clairaut's equation : $p = \log(px - y)$, where $p=\dfrac{dy}{dx}$.

7. Solve the differential equation $\dfrac{dy}{dx} + y\cot x = x\operatorname{cosec} x$

8. Determine whether the differential equation is exact

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

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

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

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 : $\int_0^a \int_y^a \frac{x}{x^2 + y^2} dxdy$, a is any positive constant.

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

$x - \frac{x^2}{\sqrt{2}} + \frac{x^3}{\sqrt{3}} - \ldots\ldots$ to ∞. 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 $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = xe^{3x} + \sin 2x$.

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 cardiode $r = a(1 - \cos\theta)$.

17. a) Solve the differential equation $\frac{dy}{dx} + \frac{x}{1-x^2} y = x\sqrt{y}$.

b) Solve the differential $xyp^2 - (x^2 + y^2)p + xy = 0$, where $p = \frac{dy}{dx}$.

18. a) Solve by Method of Variation of parameters $\frac{d^2y}{dx^2} + y = \sec x$.

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

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.