

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.