

Roll No.

Total No. of Pages : 02

Total No. of Questions : 18

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

MATHEMATICS-III

Subject Code : BTAM-304-18

M.Code : 76393

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

Write briefly :

- Find the first order derivative of $f(x, y) = \tan^{-1} \frac{x^2 + y^2}{x + y}$ w.r.t. x
- Evaluate the integral $\int_1^2 \int_0^x \frac{dy dx}{x^2 + y^2}$
- Give examples of the convergent and divergent sequences.
- State Cauchy Root test for convergence of a positive term infinite series.
- Write down the Taylor's series expansion for $\sinh x$ about $x = 0$.
- Write down the Clairaut's equation and find its solution.
- Solve the differential equation : $3e^x \tan y dx + (1 + e^x) \sec^2 y dy = 0$
- Check whether the given equation is exact or not, if yes then find solution $2xy dx + x^2 dy = 0$
- Solve the differential equation $\frac{d^3 y}{dx^3} - 6 \frac{d^2 y}{dx^2} + 11 \frac{dy}{dx} - 6y = 0$
- Find Particular integral for $\frac{d^2 y}{dx^2} - 6 \frac{dy}{dx} + 9y = e^{3x}$.

SECTION-B

11. Find the dimensions of the rectangular box, open at the top of maximum capacity whose surface is 432 sq. cm.
12. Find the area bounded by the parabola $y = x^2$ and the line $y = 2x + 3$.
13. For what value(s) of x does the series converge (i) conditionally (ii) absolutely?

$$\sum_{n=1}^{\infty} \frac{(-1)^n (x+2)^n}{n2^n}. \text{ Also find the interval of convergence}$$

14. Solve the differential equation :

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

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 $\sum_{n=2}^{\infty} \frac{n!2^n}{n^n}$

b) Find the volume of the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$

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

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

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

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

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.