Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 18

B.Tech. (CE/ME/ECE/EE) (2018 & Onward) (Sem.–1)

B.Tech. (Agriculture Engineering)/(Automation & Robotics) /(Automobile Engineering)/(CSE)/(Electrical & Electronics Engineering)/(Electronics & Electrical Engineering)

MATHEMATICS-I

Subject Code : BTAM-101-18

M.Code : 75353

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 & C have FOUR questions each.**
3. **Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.**
4. **Select atleast TWO questions from SECTION - B & C.**

SECTION-A

1. Test the convergence of the following series $\frac{2!}{3} + \frac{3!}{3^2} + \frac{4!}{3^3} + \ldots$

2. State the Raabe's test.

3. State Rolle's theorem.

4. State Langrange's mean value theorem.

5. Prove that $\int_0^{\frac{\pi}{2}} \log \tan x \, dx = 0$.

6. Evaluate $\int_0^1 \int_0^x e^{\frac{x}{y}} dy dx$.

7. Change the order of integration of $\int_0^1 \int_{y^2}^{y^{\frac{1}{3}}} f(\ ,\ )$.

8. Find the first order derivative of $z = x^3 + y^3 - 3axy$.

9. Find the rank of the following matrix $\begin{vmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{vmatrix}$.

10. Find the determinant of the following matrix $\begin{bmatrix} 1 & 2 & 5 \\ 2 & 3 & 6 \\ 1 & 4 & 7 \end{bmatrix}$.

SECTION-B

11. If $u = x^2 \tan^{-1}\frac{y}{x} + y^2 \tan^{-1}\frac{x}{y}$. Show that $\frac{\partial^2 u}{\partial x \partial y} = \frac{x^2 - y^2}{x^2 + y^2}$.

12. Evaluate $\iint \frac{xydxdy}{(1+y^2)^{1/2}}$ over the first quadrant of the circle $x^2 + y^2 = 1$.

13. Test the convergence of the series $\frac{4.7.....(3n+1)x^n}{n!}$.

14. Verify if the matrix $A = \frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ 2 & 2 & -1 \end{bmatrix}$ is orthogonal and hence find its inverse.

SECTION-C

15. Find the maximum and minimum value of $x^3 + y^3 - 3axy$.

16. a) Solve the simultaneous equations $x + y + z = 3$, $x + 2y + 3z = 4$, $x + 4y + 9z = 6$.

    b) Find the inverse of the matrix $\begin{bmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{bmatrix}$.

17. a) Find the area of the surface of revolution generated by revolving the curve $x = y^3$ from $y = 0$ to $y = 2$.

    b) Evaluate $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x-z}(x-y-)$.

18. a) Test the convergence of the series $\frac{1}{2\sqrt{1}} - \frac{x^2}{3\sqrt{2}} - \frac{x^2}{4\sqrt{3}} - \frac{x^6}{5\sqrt{4}} - .....$

    b) Find the Maclaurin's series of $f(x) = \cos x$.

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.