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Total No. of Pages : 02

Total No. of Questions : 08

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

MATHEMATICS-I

Subject Code : BTAM-101-18

M.Code : 75353

Time : 2 Hrs.

Max. Marks : 30

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE question(s), each question carries 6 marks.

1. a) Expand $f(x) = e^{\alpha \sin^{-1} x}$ in ascending powers of x upto x^4 .
b) Evaluate $\lim_{x \rightarrow 0} \frac{e^x - e^{-x} - 2 \log(1+x)}{x \sin x}$.
2. a) Find the maximum value of $\sin^p x \cos^q x$.
b) Find the volume of the solid generated by revolving the curve $xy^2 = 4(2-x)$ about y -axis.
3. a) If $u(x, y) = \frac{x^2 + y^2}{x + y}$, then prove that $\left(\frac{\partial u}{\partial x} - \frac{\partial u}{\partial y} \right)^2 = 4 \left(1 - \frac{\partial u}{\partial x} - \frac{\partial u}{\partial y} \right)$.
b) Find the maximum and minimum values of $x^3 + 3xy^2 - 3y^2 + 4$.
4. a) Evaluate $\int_0^a \int_0^{\sqrt{a^2 - y^2}} (x^2 + y^2) dx dy$ after changing into polar coordinates.
b) Evaluate $\iint_R (x+y) dx dy$ where R is the region bounded by $x = 0, x = 2, y = x, y = 2+x$.
5. a) Examine the convergence of the series $\sum_{n=1}^{\infty} \frac{1}{n^p}$ when $|p| \leq 1$.
b) Examine the series $1 + \frac{1}{2^2} + \frac{2^2}{3^3} + \frac{3^3}{4^4} + \dots$ for convergence.

6. a) Examine $\frac{1}{1.2.3} + \frac{1}{2.3.4} + \frac{1}{3.4.5} + \dots$.
- b) Examine the series $\frac{x}{1+x} - \frac{x^2}{1+x^2} + \frac{x^3}{1+x^3} - \dots$, $0 < x < 1$ for convergence.
7. a) Determine whether the vectors $u = (1, 2, 3)$ and $v = (7, -4, 2)$ are linearly dependent?
- b) Solve the system of linear equations $3x + y + 2z = 3$, $2x - 3y - z = -3$, $x + 2y + z = 4$.
8. Find the characteristic equation of the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$ and hence compute A^{-1} . Also express the matrix represented $A^5 - 4A^4 - 7A^3 + 11A^2 - A - 10I$.

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