Code No. 9002 / M

FACULTY OF ENGINEERING AND INFORMATICS

B.E. I Year (Main) Examination, May / June 2016

Subject : Mathematics - I

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART - A (25 Marks)

I Let $f = \frac{1}{3 - x^2}$ and f(0) W I. Find an interval in which f(1) lies. (2)

2 Find the equation of the envelope of the family of straight linOs $y = cx + c^2$ where c is a parameter. (3)

3 Prove that $f(x, y) \begin{cases} \frac{x^2 \quad xy + x + y}{x + y}; & (x, y) \# (2,2) \\ 4 & ; (x, y) = (2,2) \end{cases}$ (2)

is discontinuous at the point (2, 2).

4 If f(x, y) = tan (x y), find an approxima pvaluef f(I .1, 0.8) using the Taylor series linear approximation. (3)

5 Evaluate the double integral „ty dx dy,, where IT is the region bounded by the x-axis, the line y = 2x and t parabola $x^2 = 4ay$. (2)

6 If a is a constant vector,an $xi + yj + zk$ then prove that ❑X(axi-̄) (3)

7 Test whether the vectors (1,0,0), (0,2,0), (0,0,3) are linearly independent or not. (2)

8 Find all values of A for which rank of the matrix. (3)

$$A = \begin{bmatrix} \lambda & -1 & 0 & 0 \\ 0 & 2 & --1 & O \\ 0 & 0 & 2 & -I \\ -6 & 11 & 6 & 1 \end{bmatrix}$$

is equal to 3.

9 Test the convergence of the series $\left| \frac{(1 + nx)^r}{n^n} \right|$ (2)

10 Show by an example that every convergent series need not be absolute convergent. (3)

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PART - B (50 Marks)

11 a) State and prove Lagrange's mean value theorem. (5)
b) Find the evolute of $x^2 = 4ay$. (5)

12 a) Find the shortest distance between the line y = 10 - 2x and the ellipse (5)

$$\frac{x^2}{4} + \frac{y^2}{9} = 1$$

b) Show that $\lim_{(x,y)\to(0,0)} \frac{xy}{x+y}$ does not exist. (5)

13 a) Show that the vector field defined by e vector function
xyz(yzi + xzj + xyk) is
conservative.

b) Show that $\int (yz\,dx + (z + xz + z^2)dy + (y + 2yz)dz$ is independent of the
path of integration from (1, 2, 2) to (2, 3, 4). Evaluate the integral.

14 a) Prove that eigen values of Hermitian matrix are real
ii) a skew-Hermitian matrix are zero or purely imaginary.

b) Examine $A = \begin{bmatrix} 1 & 0 & i \\ 0 & 1 & 0 \\ -i & 0 & 3 \end{bmatrix}$ is positive definite.

15 a) Discuss the convergence of the series $\sum \frac{1.3.5..(2n-1)}{2.4.6..(2n)} \frac{x^{2n}}{2n}$

b) Testthe convergence of the series $1 + 3x + 5x^2 + 7x^3 + \ldots$

16 a) State and prove Cayley Hamilton theorem.

b) Find the eigen values and the corresponding eigen vectors.

$$A = \begin{bmatrix} 1 & 2 & 2 \\ 0 & 2 & 1 \\ -1 & 2 & 2 \end{bmatrix}$$

17 a) If x = r case, y = r sineY;.then find $\left(\frac{\partial r}{\partial x}\right)^2 + \left(\frac{\partial r}{\partial y}\right)^2$ (5)

b) If $u = \log [x^2 + xy + y^2]$ then find $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$. (5)

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