Code No. 6002 / M

FACULTY OF ENGINEERING and INFORMATICS

B.E, I - Year (Main) Examination, June 2014

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)

1 Define rank of a matrix. (2)

2 Show that the vectors (1, 2, 3), (2, 3, 4) and (3, 4, 5) are linearly dependent. (3)

3 State the necessary condition for a positive series a„ to be convergent. (2)

4 Discuss the convergence of f . (3)

5 Using the Lagrange mean value theorem, show that sin b – $\sin a$! O) (2)

6 Find the radius of curvature for the curve $y = x^2 - 6x + 10$ at (3, 1). (3)

7 Show that $\lim_{(x,y)\to(0,0)} \frac{x^3 y}{x^6 + y^2}$ does not exist. (2)

8 Expand f(x, y) = x³ + y³ ... 9x - 9y + 26 in Taylor series of maximum order about (2, 2). (3)

9 Find of , if f(x, y, z) = lo e $(x^2 + y^2 + z^2)$ (2)

10 Show that the vector $(x + yz)\, i + (4y - z^2 x)j + (2xz\ 4z)k$ is solenoidal (3)

PART - B (50 Marks)

11 a) Test for consistency and solve 2x 3y + 7z = 5 , 3x + y 3z = 13, 2x + 19y 47z = 32. (5)

b) Verify Cayley - Hamilton theorem for the matrix A = 3 (5)

12 a) Discuss the convergence of the series $\sum \left(\frac{n+2}{n+3}\right)^n x^n$ (5)

b) Test the series $\sum \left(\sqrt{n^4+1} - \sqrt{n^4 - 1}\right)$ for convergence. (5)

13 a) Verify Rolle's theorem for the function f(x) = (x + 2) (x - 3) in the interval [-2, 3]. (5)

b) Find the evolute of the curve $x^2 = 4ay$. (5)

14 a) Find all asymptotes of the curve 1 = x + -- (5)

b) Discuss the maxima and minima of $f(x, y) = 4x^2 + 2y^2 + 4xy - 10x - 2y - 3$. (5)

15 a) Show that $\nabla^2 (r^n) = n(n+1) r^{n-2}$, where $r = i$, = xi+ zk (5)

b) If S is any closed surface enclosing a volume V and $F = ax\ 4 j$ - prove that $\int F \cdot ds = (a + b + c) V$. (5)

16 a) Find the eigen values and the corresponding eigen vectors of A = 0 4 I 0) 0 6 (5)

b) Discuss convergence of $1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \frac{1}{5^2}$ ...... (5)

17 Verify Green's theorem for $\int_C (x y - 8 y^2) dx + (4y - 6 x) dy$ where C is the boundary of the region bounded by x = 0, y = 0 and x + y = 1. (10)