Code No. : 3312/N

FACULTY OF ENGINEERING & INFORMA.TICS

B.E. 1 Year (New) (Common to all branches) (Main) Examination, June 2011

MATHEMATICS - I

Time : 3 Hours] **[Max. Marks : 75**

Note : Answer all questions from Part - A. Answer any five questions fr6m Part -B.

PART A (Marks : 25)

Using the Lagrange's mean value theorem, show that I sin b - sin al b 2

Find the envelope of the family ofrcurves $y = 3cx - c^3$, c is a parameter. 3

3. If f(x, y, z) xy4 yz zx, $x = t^2$, y tet, = te¯t, find df

4. Find the linear Taylor series polynomial approxiniation to the function Y $= 2x^3 + 3y^3 - 4x^2y$ about the point (1, 2).

5. If $\bar{r}$ = xi + yj + zk, show that (ii . V)i = Ci. 2

6. Find the directional derivative of the function x, y, = 'z a (1, 2, 3) in the direction of the line i = ,i = i.. 3

7. Find the values of X such that the rank of

(1 . 2 4'
A = 2 A 5 is 2.
4 8 X i

8. Find tbe sum and the product of eigen values of,-)the.matrix

. 10	0	8
4	9.	6
2	7	5

-9. Find the values of x fOr which the series E(4)r)" is convergent.

10. Show that the series $E\frac{\sin nx}{n^2}$ converges absolutely.

PART B (Marks 50)

11. (a) Find the radiuS of curvature of the curve x a(0 - sin 0), y a(1 - cos 0) at 0 = 5

(b) Find the evolute of the curve x .2 at, $y = at^2$. 5

(This paper contains 2 pages) P.T.O.

Code No. : 3312/N .

12. (a) Trace the curve r = all + cos 0). 6

(b) Show that f(x, y) = $\frac{x^2 + y2}{x - y}$, (x, y) (0, 0) is not continuous at
0 (x, y) . (0, 0)
(0, 0). **4**

•13. (a) Prove that curl (f V) = (grad f) 'x V +f curl V. 5

(b) Using.Green's theorem, evaluate | ($x^2 + y^2$) dx + (y + 2x)dy, where C is the bouridary of the region bounded by the curves y^2 = x and x^2 y. 5

14. (a). If A = $\begin{pmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$, Show that An . n - 2 + A^2 - , n .3 using Cayley-Hamilton theorem. 5

(b) Reduce A = $\begin{pmatrix} 1 & 2 & — \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{pmatrix}$ I to the diagonal form. . . 5

• 15. Discuss the convergence of the series.

(a) 1 + $\frac{2!}{2^2}$ + $\frac{3!}{3^3}$ + $\frac{4!}{}$ + ... **4**

(b) $\frac{nn}{n.}$ x > 0 . **6**

16. (a) If f(x, y) = $\frac{x + y2}{0}$ (x, (13.1 9) (x, y) = (0, 0), compute $\frac{2f}{ak}$ (0, **b).** **4**

(b) Find the minimum value of f(x, y, z) =x^2 + y^2 +' z^2 subject to the condition xyz a^3. **6**

17. (a) Evaluate $\int_0^{\infty}\int_0^{\infty}$ ffe$^{-0(21-y^2)}$ dx dy. 5

(b) Test whether the vectors (1, 1, 0, 1), (1, 1, 1, 1), (4, 4, 1, 1), (1, 0, 0, 1) are linearly independent or not 5