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**Reg. No. :**

**Question Paper Code: 11002**

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2014.

First Semester

Civil Engineering

01UMA102 ENGINEERING MATHEMATICS – I

(Common to all branches)

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. The product of two eigenvalues of the matrix is 16. Find the third eigenvalue.

2. Determine the nature of Q.F. .

3. Show that the plane touches the sphere

.

4. Find the equation of the right circular cone with vertex at the origin, whose axis is

and with a semi-vertical angle .

5. Find the radius of curvature of the curve at .

6. Find the envelope of where is the parameter.

7. If using Euler’s theorem show that .

8. If and find .

9. Evaluate  .

10. Sketch roughly the region of integration for .

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Find the eigenvalues and eigenvectors of the matrix . (8)

(ii) Using Cayley Hamilton theorem find the inverse of the matrix . (8)

Or

(b) Reduce the quadratic form to canonical form by orthogonal reduction. Also find the nature of the quadratic form. (16)

12. (a) (i) Find the equation of the sphere having the circle as the greatest circle. (8)

(ii) Find the equation of the cone formed by rotating the line   
 about the . (8)

Or

(b) (i) Find the equation of the sphere which touches the sphere

at the point and passes through the origin . (8)

(ii) Find the equation to the right circular cylinder whose guiding circle is

. (8)

13. (a) (i) Find the envelope of the lines being the parameter. (8)

(ii) Find the equation of evolute of the parabola . (8)

Or

(b) (i) Find the circle of curvature of the curve at . (8)

(ii) Find the evolute of the parabola considering it as the envelope of its   
normals. (8)

14. (a) (i) If where prove that

. (8)

(ii) Find the minimum value of given that . (8)

Or

(b) (i) Expand in powers of and upto third degree

terms using Taylor’s theorem. (8)

(ii) Examine for its extreme values. (8)

15. (a) (i) Change the order of integration in  and hence evaluate it. (8)

(ii) Evaluate  by changing into polar co-ordinates. (8)

Or

(b) (i) Evaluate  over the area bounded by the ellipse . (8)

(ii) Express the volume of sphere as a volume integral and hence evaluate it. (8)