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**Reg. No. :**

**Question Paper Code: 31002**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

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. | Prove that, if *A* is orthogonal then *AT* and *A-1* are orthogonal. CO1- App | | | |
| 2. | Verify Cayley-Hamilton theorem for the matrix  CO1- App | | | |
| 3. | Find the center and radius of the sphere CO2- U  . | | | |
| 4. | Define the right circular cylinder. CO2- U | | | |
| 5. | Find the radius of curvature at the point  at (-2, 0). CO3- U | | | |
| 6. | Find the radius of curvature for  at the point where it cuts the CO3- U  Y- axis (or) at x=0. | | | |
| 7. | If *W= f ,* then prove that *x* CO4- U | | | |
| 8. | If (*cos x)y* = *(sin y)x* find . CO4- U | | | |
| 9. | Evalute  CO5- Ana | | | |
| 10. | Change the order of integration in . CO5- Ana | | | |
|  | PART – C (5 x 16= 80Marks) | | | |
|  |  |  |  |  |
| 11. | (a) | Reduce the quadratic form *2xy+2yz+2zx* to a canonical form by orthogonal reduction. Also find the rank, index, signature and nature of the quadratic form. | CO1- U | (16) |
|  |  | Or |  |  |
|  | (b) | Verify Cayley Hamilton theorem and hence find and  for the matrix . | CO1- U | (16) |
|  |  |  |  |  |
| 12. | (a) | (i) Find the equation of the sphere that passes through the circle  and  cuts the sphere  orthogonally. | CO2- App | (8) |
|  |  | (ii) Find the equation of the enveloping cylinder of the sphere  having its generators parallel to the  line x = y = z. | CO2- App | (8) |
|  |  | Or |  |  |
|  | (b) | (i) Find the center, radius and area of the circle | CO2- Ana | (8) |
|  |  | (ii) Find the equation of the sphere for which the circle  is a great circle. | CO2- Ana | (8) |
|  |  |  |  |  |
| 13. | (a) | Find the evolute of the parabola  considering as the envelope of the normals. | CO-3 Ana | (16) |
|  |  | Or |  |  |
|  | (b) | Find the radius of curvature at the point on the curve x3 + y3 = 3axy | CO3- Ana | (8) |
|  |  |  |  |  |
| 14. | (a) | (i) Find the volume of the greatest rectangular parallelepiped  that can be inscribed in the ellipsoid . | CO4-U | (8) |
|  |  | (ii) Expand in powers of x and y upto terms of third  degree. | CO4-U | (8) |
|  |  | Or |  |  |
|  | (b) | (i) Expand *ex*cos y in power of x and y as far the terms of third  degree. | CO4- U | (8) |
|  |  | (ii) Find the dimensions of the rectangular box without a top of  maximum capacity, whose surface is 108 *sq. cm*. | CO4- U | (8) |
|  |  |  |  |  |
| 15. | (a) | Change the order of the integration and hence evaluate. | CO5-App | (8) |
|  |  | Or |  |  |
|  | (b) | (i) Evaluate over the area bounded by the  ellipse . | CO5-App | (8) |
|  |  | (ii) Express the volume of sphere  as a  volume integral and hence evaluate it. | CO5-App | (8) |