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 **Reg. No. :**

**Question Paper Code: 41002**

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

First Semester

Civil Engineering

14UMA102 - ENGINEERING MATHEMATICS − I

 (Common to ALL branches)

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

|  |  |  |
| --- | --- | --- |
| 1. | If the Eigen values of the matrix  are 2, -2 then the Eigen values of are  | CO1- R |
|  | (a)  | (b) 2, -2  | (c) 1, -1  | (d) 1, 3 |
| 2. | If two of the Eigen values of  are 2 and 8, then the third Eigen value is | CO1- R |
|  | (a) -2  | (b) 0 | (c) | (d) |
| 3. | A bounded sequence which does not converge is said to be |  CO2- R |
|  | (a) Divergent  | (b)Oscillating infinitely  | (c)Oscillating finitely | (d) Monotonic |
| 4. | D’Alembert’s test is also called |  CO2- R |
|  | (a) Ratio test | (b) Root test | (c) Abel’s test  | (d) None of these |
| 5. | What is the radius of curvature at (3, 4) on the curve *x2 + y2 = 25*? | CO3- R |
|  | (a) | (b) | (c) | (d) |
| 6. | The radius of curvature of the curve *xy = c2* at (*c, c*) is | CO3- R |
|  | (a) | (b) | (c)   | (d) |
| 7. | If u = (*x*-*y*)(*y*-*z*)(*z*-*x*), then  | CO4- R |
|  | (a) 0 | (b) | (c) | (d) |
| 8. | If then the value of  is | CO4- R |
|  | (a) | (b) | (c) | (d) |
| 9. | The value of  is | CO5- R |
|  | (a)   | (b)  | (c)  | (d)  |
| 10. |  | CO5- R |
|  | (a) 9 | (b)   | (c)  | (d)  |
|  | PART – B (5 x 2= 10Marks) |
| 11. | Find the characteristic equation of the matrix CO1- App |
| 12. | Show that the series  is convergent. CO2- U |
| 13. | Find the radius of curvature of the curve at *x* = 0. CO3- App |
| 14. | Change the order of integration in CO4- U |
| 15. | State any two properties of Jacobian. CO5- U |
|  | PART – C (5 x 16= 80Marks) |
|  |  |  |  |  |
| 16. | (a) | Verify Cayley Hamilton’s theorem and hence find the inverse of the matrix.   | CO1- App |  (16) |
|  |  | Or |  |  |
|  | (b) | Reduce the Quadratic form *8x2 + 7y2 + 3z2− 12xy − 8yz + 4xz*to canonical form through an orthogonal transformation and hence show that it is positive definite.  | CO1- U |  (16)  |
|  |  |  |  |   |
| 17. | (a) | Show that the series  is conditionally convergent. | CO2- App |  (8) |
|  |  | Or |  |  |
|  | (b) | (i) Show that the sum of the series . | CO2- Ana |  (8) |
|  |  | (ii) Show that the series 1 − 2 + 3 − 4 + ... ∞ oscillates  infinitely.  | CO2- Ana |  (8) |
|  |  |  |  |  |
| 18. | (a) | Considering the evolute as the envelope of normals, find the evolute of . | CO-3 Ana |  (16) |
|  |  | Or |  |  |
|  | (b) |  (i) Find the radius of curvature at any point of the cycloid   and . | CO3- Ana |  (8) |
|  |  | (ii) Find the evolute of the parabola *y2 = 4ax*. | CO3- Ana |  (8) |
|  |  |  |  |  |
| 19. | (a) | A rectangular box open at the top, is to have a volume of 32cc. Find the dimensions of the box, that requires the least material for its constructions.  | CO4-U |  (16) |
|  |  | Or |  |  |
|  | (b) | If *u* is function of *x* and *y*; by changing to polar form with *x = r cos θ, y = r sin θ*, show that . | CO4- Ana |  (16) |
|  |  |  |  |  |
| 20. | (a) | (i) Change the order of integration inand hence  evaluate it.  | CO5-App |  (8) |
|  |  | (ii) Find the area lying between the parabola *y*= *x*2 and the line  *y* = *x*.  | CO5-App |  (8) |
|  |  | Or |  |  |
|  | (b) | (i) If the centre of curvature of the ellipse  at one end  of the ellipse of the minor axis lies at the other end, prove  that the eccentricity of the ellipse is . | CO5-App |  (8) |
|  |  | (ii) Find the radius of curvature of the curve *x = a [cosθ + log(tan)], y = a sinθ at θ*. | CO5-App |  (8) |