Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **18MA1004** | **Duration :** | **3hrs** |
| **Sub. Name :** | **CALCULUS, MATRICES AND VECTOR SPACES** | **Max. Marks :** | **100** |

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| **Q. No.** | **Questions** | **Course**  **Outcome** | **Marks** |
| **PART – A (10X1 = 10 MARKS)** | | | |
| 1. | Define radius of curvature. | CO1 | 1 |
| 2. | Find the value of | CO1 | 1 |
| 3. | Examine the convergence of the sequence | CO3 | 1 |
| 4. | If the series = ---------- | CO3 | 1 |
| 5. | The Eigen values of an idempotent matrix are --------. | CO4 | 1 |
| 6. | If the eigenvalues of A is 5, 6, 7 then find the eigen values of | CO4 | 1 |
| 7. | If the linear transformation T is nonsingular, then | CO5 | 1 |
| 8. | Let U be the subspace of a finite dimensional vector space V. Then write the relationship between dim U and dim V. | CO5 | 1 |
| 9. | Find if . | CO5 | 1 |
| 10. | If . Find | CO5 | 1 |

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| **PART – B (6 X 3 = 18 MARKS)** | | | |
| 11. | Prove that | CO1 | 3 |
| 12. | Show that the series  converges if | CO3 | 3 |
| 13. | Find the sum and product of the eigen values of . | CO4 | 3 |
| 14. | Check whether the following set of vectors are linearly independent or linearly dependent | CO5 | 3 |
| 15. | Find the directional derivatives of at (1,0,1) in the direction of vector . | CO6 | 3 |
| 16. | An inner product can be defined on by . If  and , then (i) check  and  are orthogonal and (ii) find  and | CO5 | 3 |

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| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.no 17 to 23. Q.No 24 is a Compulsory Question)** | | | | |
| 17. | a. | Find the volume of the sphere of radius ‘a’. | CO1 | 6 |
|  | b | Find the surface of the solid formed by revolving the cardiod r = a(1+cosθ) about the initial line. | CO1 | 6 |
|  |  |  |  |  |
| 18. | a. | Test the convergence of the series | CO3 | 6 |
| b. | Discuss the convergence of the series | CO3 | 6 |
|  |  |  |  |  |
| 19. |  | Reduce the Quadratic form  to the canonical form and specify the matrix transformation. | CO4 | 12 |
|  |  |  |  |  |
| 20. | a. | Find the coordinates of (2,3,4,-1) relative to the ordered basis  for | CO5 | 6 |
| b. | Let  be a linear map defined by . Verify that . | CO6 | 6 |
|  |  |  |  |  |
| 21. | a. | Find the angle between the surfaces  and at the point (2,-1,2). | CO5 | 6 |
| b. | If , then prove that grad u, grad v and grad w are coplanar. | CO5 | 6 |
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| 22. | a. | Solve by using Cramer’s rule . | CO4 | 6 |
| b. | Verify Cayley Hamilton theorem for the Matrix.  . | CO4 | 6 |
|  |  |  |  |  |
| 23. | a. | Express in terms of gamma function. | CO2 | 6 |
| b. | Evaluate | CO2 | 6 |
|  |  | **Compulsory:** | |  |
| 24. | a. | Find an orthonormal basis of starting from the basis using the inner product | CO5 | 8 |
| b. | Prove that any orthogonal set of no zero vectors in an inner product space is linearly independent. | CO5 | 4 |