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



**End Semester Examination – Nov/Dec – 2017**

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| **Code :** | **17MA3005** | **Duration :** | **3hrs** |
| **Sub. Name :** | **CALCULUS OF VARIATIONS AND VECTOR SPACES.** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Find the path on which a particle in the absence of friction will slide from one point to another in the shortest time under the action of gravity. | CO1 | 10 |
| b. | Find the extremal of the functional  =  such that y(0) = 0 ; y(π/2) = -1; z(0) = 0 ; z(π/2) = 1. | CO2 | 10 |
| (OR) | | | | |
| 2. | a. | Find the geodesics on the sphere of radius “a”. | CO1 | 10 |
| b. | Find the extremal of the functional  such that y(0) = 1 ; y(π/2) = 0; . | CO2 | 10 |
| 3. | a. | Prove that the sphere is the solid figure of revolutions which for a given surface area has maximum volume. | CO1 | 10 |
|  | b. | Find the extremal of the isoperimetric problem ) dx such that dx=2. | CO2 | 10 |
| (OR) | | | | |
| 4. | a. | A particle moves on the surface φ (x, y, z) = 0 from (x1, y1, z1) to (x2, y2, z2) in time T. Show that if it moves in such a way that the integral of the kinetic energy over that time is a minimum, its coordinates must satisfy the equations = = . | CO1 | 10 |
|  | b. | Find the shortest distance between the parabola y= x 2 and x-y=5. | CO2 | 10 |
| 5. | a. | Show that the function ϕ(x)= is a solution of the Volterra integral equation ϕ (x) =  −  (t) dt. | CO1 | 10 |
|  | b. | Form the integral equation corresponding to the differential equation . | CO2 | 10 |
| (OR) | | | | |
| 6. | a. | Transform  + y = x ; y(0) = 1 ;  to a Fredholm integral. | CO2 | 10 |
|  | b. | Using the method of successive approximation solve  y(x) = x -(x - t) y(t) dt. | CO6 | 10 |
| 7. | a. | Define an equivalence relation. Find the quotient set Z / R where R is the relation defined in the set of all integers Z by aRb iff a-b is a multiple of 7. | CO3 | 10 |
|  | b. | Show that the vectors α1 = (1, 0 -1); α 2 = (1 , 2, 1 );α 3 = (0, -3, 2) forms a basis of R3. | CO4 | 10 |
| (OR) | | | | |
| 8. |  | If Rn ={(x1,x2 , x3,…….xn) / x1,x2 , x3,…….xn ∈ R} then prove that (Rn, + , . ) is a vector space with respect to the standard addition and scalar multiplication. | CO4 | 20 |
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|  | | **Compulsory:** |  |  |
| 9. | a. | Find the Z transform of Z[coshat .sinbt ]. | CO1 | 5 |
|  | b. | Using partial fraction method find the inverse Z-Transform of | CO5 | 5 |
|  | c. | Solve Y n+2 – 4 Y n+1 + 4 Yn = 0 given Y0 = 1; Y1 =0. | CO5 | 10 |

ALL THE BEST