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



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – April/May – 2017**

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| **Code :** | **15MA3013** | **Duration :** | **3hrs** |
| **Sub. Name :** | **CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS** | **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. | Derive Brachistochrone problem(shortest time) under gravity. | CO1 | 10 |
| b. | Find the curves on which the functional  with y(0)=0 and y(1)=1 can be extremum. | CO1 | 5 |
|  | c. | Prove that the shortest distance between two points in a plane is a straight line. | CO1 | 5 |
| (OR) | | | | |
| 2. | a. | State and prove the necessary condition for the functional  to be an extremum. | CO1 | 10 |
| b. | Find the extremal of the function , , given thaty(0)=0,y’(0)=1,y(π/4)=y’(π/4)= | CO1 | 10 |
| 3. | a. | Prove that the sphere is the solid figure of revolution ,which for a given surface area has maximum volume. | CO2 | 10 |
|  | b. | Solve given that y(0)=y(π/2)=0 by Rayleigh Ritz method. | CO2 | 10 |
| (OR) | | | | |
| 4. | a. | Solve the boundary value problem y’’- y+x=0 (0≤x≤1),y(0)=y(1)=0 by Galerkin’s method.Compare your approximate solution with exact solution. | CO2 | 13 |
|  | b. | Find the geodesics on a sphere of radius ‘a’ | CO2 | 7 |
| 5. | a. | Find the integral equation corresponding to the initial value problem  when x=0 | CO3 | 10 |
|  | b. | Find the Volterra integral equation of second kind corresponding to the differential equation | CO3 | 10 |
| (OR) | | | | |
| 6. | a. | Find the integral equation corresponding to the initial value problem  ,given that y=1,y’=0 when x=1. | CO3 | 10 |
|  | b. | Check whether the function is the solution of the Volterra integral equation ,where. | CO3 | 10 |
| 7. | a. | Using Green’s function,solve the boundary value problem y’’+y=x,y(0)=y(π/2)=0 | CO3 | 10 |
|  | b. | Find the characteristic numbers and eigon functions for the homogeneous integral equation with degenerate kernels | CO3 | 10 |
| (OR) | | | | |
| 8. | a. | Find the Green’s function for the boundary value problem y”+a2x=0,y(0)=0=y’(1) | CO3 | 10 |
|  | b. | Solve the integral equation with degenerate kernels | CO3 | 10 |
|  | | **Compulsory**: |  |  |
| 9 | a. | By means of resolvent kernel,solve | CO3 | 10 |
|  | b. | Using method of successive approximations,solve the integral equation | CO3 | 10 |