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 – Nov/Dec – 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **15MA3002** | **Duration :** | **3hrs** |
| **Sub. Name :** | **Ordinary Differential 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. | State and prove the Existence and Uniqueness Theorem of Linear Differential Equations. | CO1 | 10 |
| b. | Define the Fundamental Matrix.And also prove that | CO1 | 10 |
| (OR) | | | | |
| 2. | a. | State and Prove Picards Theorem. |  | 20 |
| 3. | a. | Explain Fixed Point Method. | CO2 | 10 |
|  | b. | Define Contraction Principle and apply this result to establish the Existence and Uniqueness of the solutions of Initial Value Problems. | CO2 | 10 |
| (OR) | | | | |
| 4. | a. | State and Prove the Existence and Uniqueness Theorem of Non Linear Differential Equations. | CO2 | 10 |
|  | b. | Define Upper and Lower Solution.  And also Prove that let and . Then there exists a solution of the IVP . | CO2 | 10 |
| 5. | a. | Let be lower and upper solution of such that on I=[. Suppose that for and Then there exists monotone sequences } such that ⟶ uniformly and monotonically on I and that are minimal and maximal solution of IVP. | CO2 | 20 |
| (OR) | | | | |
| 6. | a. | State and prove Bihari’s Inequality. | CO3 | 10 |
|  | b. | Suppose that f(t,x) is non increasing in x then  (i)There exists lower and Upper solutions of such that .  (ii) there exist a unique solution x of the IVP on I such that | CO3 | 10 |
| 7. | a. | Prove that an integral inequality which fuses the Gronewall in equality and the Bihari’s Inequality. | CO3 | 10 |
|  | b. | State one Application of Bihari’s Integral In equality. | CO3 | 10 |
| (OR) | | | | |
| 8. | a. | State and Prove Alekseev’s Formula. | CO4 | 10 |
|  | b. | Define the following with examples.   1. Linear Homogeneous BVP 2) Linear non Homogeneous BVP   3)Periodic Boundary Conditions 4) Regular Linear BVP 5) Singular Linear BVP. | CO4 | 10 |
|  | | **Compulsory:** |  |  |
| 9. | a. | State and Prove Sturm’s Comparison Theorem and Sturm;s separation Theorem. | CO4 | 20 |

ALL THE BEST