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



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

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| **Code :** | **19MA3002** | **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. | Let be an  matrix which is continuous on I. Suppose a matrix satisfies . Then show that satisfies the first order equation . | CO2 | 15 |
| b. | Compute the first three successive approximations for the following system: | CO1 | 5 |
| **(OR)** | | | | |
| 2. | a. | Consider the system given that and . Show that a fundamental matrix is . Let . Find the solution of the non homogeneous equation for which . | CO2 | 8 |
| b. | State and prove Gronwall inequality. Also prove, if then, for. | CO5 | 12 |
|  |  |  |  |  |
| 3. | a. | Determine the constants and *H* for the initial value problem | CO2 | 5 |
| b. | State and prove the contraction principle. Also prove that the initial value problem has a unique solution defined on if the function is continuous in the strip and satisfies the Lipschitz condition being Lipschitz constant. | CO4 | 15 |
| **(OR)** | | | | |
| 4. |  | Let be lower and upper solutions of such that on . Suppose further that for and. Then prove that there exist monotone sequences such that  and  as  uniformly and monotonically on I and that v,w are maximal and minimal solutions of . | CO4 | 20 |
|  |  |  |  |  |
| 5. |  | State and prove Bihari’s inequality. Also deduce the integral inequality which fuses the Grownwall’s inequality and Bihari’s inequality. | CO5 | 20 |
| **(OR)** | | | | |
| 6. | a. | Let the function be continuous and bounded on the infinite strip in open connected region D. Then prove that the initial value problem  has at least one solution existing on the interval | CO4 | 10 |
| b. | State and prove comparison theorem for maximal and minimal solution. | CO4 | 10 |
|  |  |  |  |  |
| 7. | a. | Given and satisfy . Suppose further that where and g(u) is nondecreasing in u. Then prove that. | CO5 | 10 |
| b. | State and prove Alekseev’s formula. | CO3 | 10 |
| **(OR)** | | | | |
| 8. | a. | Establish the Green’s fuction of and hence solve it. Also prove that . | CO6 | 10 |
| b. | State and prove Sturm’s comparison theorem. | CO2 | 10 |
|  | | **Compulsory**: |  |  |
| 9. |  | State and prove Picard’s theorem for boundary value problem. | CO6 | 20 |