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

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**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **18MA3008** | **Duration :** | **3hrs** |
| **Sub. Name :** | **NON LINEAR 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. | Locate the equilibrium points and sketch the phase paths of | CO1 | | 10 |
| b. | Explain briefly about Recurrent epidemic model. | CO1 | | 10 |
| (OR) | | | | | |
| 2. |  | Explain briefly about predator-prey problem. | CO1 | | 20 |
|  |  |  |  | |  |
| 3. | a. | Obtain approximate solutions to the vander pol equation  using an equivalent linear equation. | CO2 | | 5 |
| b. | Obtain the period amplitude relation for the poisson Boltzman equation | CO2 | | 10 |
| c. | Obtain an approximation to the amplitude and frequency of the limit cycle for Raleigh’s equation | CO2 | | 5 |
| (OR) | | | | | |
| 4. | a. | Check the stability of the limit cycle of for small | CO2 | | 10 |
| b. | Describe briefly about an energy balance method for life cycles. | CO2 | | 10 |
|  |  |  |  | |  |
| 5. | a. | Obtain an approximation to the forced response of period for the equation | CO3 | | 10 |
| b. | Investigate the forced periodic solutions of the equation  , where  is small and are not too large. | CO3 | | 10 |
| (OR) | | | | | |
| 6. | a. | Describe briefly about forced oscillation of a vander pol equation | | CO4 | 10 |
| b. | Find the leading approximation of the undamped system  . Show that there are three possible amplitudes. | | CO4 | 10 |
|  |  |  | |  |  |
| 7. | a. | Prove that  (i) n+1 nonzero solutions of the homogeneous system  are linearly dependent  (ii) The functions cost, sint, 2sint are linearly dependent. | | CO5 | 10 |
| b. | Verify that , are solutions of ,  And find the solutions x(t) such that | | CO5 | 10 |
| (OR) | | | | | |
| 8. | a. | Prove that For any  wronskian of  is  where tr(A(s)) is the trace of | CO5 | | 10 |
| b | Find a fundamental matrix for the periodic differential equation  where  =and determine the characteristic numbers. | CO5 | | 10 |
|  | | |  | |  |
| **Compulsory:** | | |  | |  |
| 9. | a. | Find the fundamental matrix for the system  , , | CO6 | | 10 |
| b. | Show that the zero solutions of the equation    is asymptotically stable for k>0. | CO6 | | 10 |