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 :** | **14EI3005** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ADVANCED CONTROL SYSTEM** | **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. | Consider the mechanical system given below. Model the system and derive the transfer function in terms of X3(s) and F(s) | CO1 | 15 |
| b. | What are the essential elements of control systems | CO1 | 5 |
| (OR) | | | | |
| 2. | a. | Write the steps involved in mathematical model of a process. | CO1 | 5 |
| b. | Obtain the mathematical model in state space of a permanent magnet stepper motor from its principles. | CO1 | 15 |
| 3. | a. | Solve the equation  with the initial condition x = 0, y = 0 using modified Euler’s method and tabulate the solutions at x = 0.1, 0.2 and 0.3. Compare the result with the results of the exact solution | CO2 | 10 |
|  | b. | Find y (0.1) by Taylor series method if ; y(0) = 1. | CO2 | 10 |
| (OR) | | | | |
| 4. |  | Consider u1=-2tu2 where u(0)=1 with h=0.2 on the interval [0,0.6].  Solve the initial value problem given above. Use 4th order RK method. | CO3 | 20 |
| 5. | a. | Give a short note on the relationship between controllability and observability. | CO2 | 5 |
|  | b. | The state model of a system is    Convert the state model to controllable phase variable form. | CO3 | 15 |
| (OR) | | | | |
| 6. | a. | Solve the given differential equation using Taylor series.  ; While its initial conditions are x(0) = 1 and | CO2 | 12 |
|  | b. | Write short notes on phase planes and phase trajectories. | CO1 | 4 |
|  | c. | Briefly explain principle of linearization. | CO1 | 4 |
| 7. | a. | Define the terms controllability and observability. | CO3 | 5 |
|  | b. | A single-input system is described by the following state equation. Design a state feedback controller which will give closed-loop poles at -1+j2, -1-j2, -6. | CO2 | 15 |
| (OR) | | | | |
| 8. | a. | Consider the system defined by:    Where  By using state-feedback control , it is desired to have the closed-loop poles at  Determine the state-feedback gain matrix . | CO2 | 15 |
|  | b. | Consider a system  Output:  Is the system controllable? | CO3 | 5 |
|  | | **Compulsory:** |  |  |
| 9. | a. | Comment on the significance of Lyapunov Stability. | CO3 | 10 |
|  | b. | Explain in brief about Lyapunov Stability theorems. | CO3 | 10 |

ALL THE BEST