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**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

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

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

**End Semester Examination – Nov/Dec - 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **10EI213/EI214/EI259** | **Duration :** | **3 hrs** |
| **Sub. Name :** | **Digital Control Systems** | **Max. marks :** | **100** |

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| **Q. No.** | **Questions** | **Marks** |
| **PART-A(10X1=10 MARKS)** | | |
| 1. | State Shannon’s sampling theorem. | (1) |
| 2. | Define droop rate with respect to sample and hold operation. | (1) |
| 3. | What is the stable region of Z-plane? | (1) |
| 4. | What is bilinear transformation? | (1) |
| 5. | Mention the features of Dahlin’s control algorithm. | (1) |
| 6. | Give any one advantage of parallel realization. | (1) |
| 7. | State the condition when a controller is said to be physically unrealizable. | (1) |
| 8. | What is ringing in digital controller? | (1) |
| 9. | Write the position form of PID algorithm. | (1) |
| 10. | Give any two advantages of microprocessor based control systems. | (1) |

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| **PART B(5 X 3= 15 MARKS)** | | |
| 11. | List the three methods employed to determine the inverse Z-transformation. | (3) |
| 12. | List the factors to be considered while selecting the sampling frequency. | (3) |
| 13. | State the final value theorem of Z transform. | (3) |
| 14. | Brief about the design specifications of Kalman’s algorithm. | (3) |
| 15. | Give the state model of SISO, second order system. | (3) |

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| **PART C(5 X 15= 75 MARKS)** | | | |
| 16. | a. | Derive the transfer function of Zero Order Hold. | (8) |
| b. | Briefly explain the operation of R-2R ladder 3-bit D/A converter with neat circuit. | (7) |
| (OR) | | | |
| 17. | a. | Explain the principle and operation of Successive Approximation type A/D Converter with neat diagram. | (15) |
| 18. | a. | For the sampled data system given below, find the response y(k) for unit step change in  input r(k)    ZOH  T  **T=1 Sec**  Y(s)  R(s) |  |
| (OR) | | | |
| 19. | a. | Determine the stability using Jury’s test  Δ(Z) = Z4- 1.7Z3+1.04Z2-0.2683Z + 0.024=0. | (5) |
| b. | Determine the stability of the following system using bilinear transformation Δ(Z) = Z3 - 0.2 Z2 - 0.25 Z + 0.05 | (10) |
| 20. | a. | A feedback system has a closed-loop transfer function  Construct the three state models for the system. | (15) |
| (OR) | | | |
| 21. | a. | Perform controllability and observability test for the system given below.  = +u  Y= | (15) |
| 22. | a. | Derive the digital equivalent of velocity form of PID algorithm. | (8) |
| b. | Explain any digital control system using microcontroller with block diagram. | (7) |
| (OR) | | | |
| 23. | a. | Design Deadbeat controller algorithm for a system having a model Gp(s) with  unity feedback. The sampling period T=0.4 sec. Also check whether the controller is  physically realizable or not. | (15) |
| 24. | a. | With relevant diagrams, explain the microprocessor based temperature control system. | (15) |
| (OR) | | | |
| 25. | a. | Explain the interfacing of stepper motor to microprocessor with the help of neat circuit  diagram. | (15) |

ALL THE BEST