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 :** | **14EI3006** | **Duration :** | **3hrs** |
| **Sub. Name :** | **DISCRETE CONTROL SYSTEMS** | **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 any five properties of z-Transform. | CO1 | 5 |
| b. | Determine the Initial Value and Final value of the given z-domain signal | CO1 | 5 |
| c. | Find out the one-sided z-transform for the given continuous time function. | CO1 | 10 |
| (OR) | | | | |
| 2. | a. | Using Bilinear Transformation, find whether the given characteristic polynomial is stable or not. | CO1 | 10 |
| b. | Using Jury’s Stability test, check for stability of the sampled data control system represented by the following Characteristic equation: | CO1 | 10 |
| 3. | a. | Determine the state model of the system in Jordan Canonical form for the given discrete-time system transfer function. | CO1 | 10 |
|  | b. | Construct the state model of the given mechanical translational system. | CO1 | 10 |
| (OR) | | | | |
| 4. | a. | Determine the State model in Canonical form and also for input u(k)=1; k≥1; find the output y(k) for the given discrete time system which is described by the difference equation,. | CO2 | 13 |
|  | b. | Describe the State space representations of discrete time systems. | CO1 | 7 |
| 5. | a. | Consider the system x(k+1)=Gx(k)+Hu(k),    Determine the suitable state feedback gain matrix K using Ackermann’s formula, such that the system will have the closed loop poles at z = -1+j2,-1-j2,-6. | CO3 | 15 |
|  | b. | Check whether the given system is observable or not. | CO3 | 5 |
| (OR) | | | | |
| 6. | a. | Describe about the Full order State Observer with the block diagram. | CO3 | 6 |
|  | b. | Design a full-order state observer for the given system x(k+1)=Gx(k)+Hu(k); y(k)=Cx(k); where  and the desired eigen values of the observer matrix are 0.5±j0.5. | CO3 | 10 |
|  | c. | Check for Controllability for the given discrete time system, x(k+1)=Gx(k)+Hu(k); y(k)=Cx(k); where, | CO3 | 4 |
| 7. |  | With necessary block diagrams, describe the various configurations of control systems design based on polynomial equations approach in detail. | CO2 | 20 |
| (OR) | | | | |
| 8. | a. | Write brief notes on Diophantine Equation. | CO2 | 5 |
| b. | Solve the Diophantine equation for the given Polynomial.  A(z)=z2+z+0.5; B(z)=z+2; D(z)=z3 | CO2 | 15 |
|  | | **Compulsory:** |  |  |
| 9. |  | Describe the hardware features of the design of a microprocessor based controller for a Position Control system. | CO3 | 20 |

ALL THE BEST