**Reg. No. :** | | | | | | | | | | |

# Question Paper Code: 37602

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Seventh Semester

Instrumentation and Control Engineering

01UIC702 - DIGITAL CONTROL SYSTEM

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. What is sampled data control system?
2. List any two advantages of digital control system.
3. State (shanon's) sampling theorem.
4. Explain the terms sampling and sampler.
5. What are the properties of ROC?
6. What is zero order hold?
7. Write the properties of state variable model.
8. State the condition for controllability by Kalman's method.
9. What is the necessary condition to be satisfied for design using state feedback?
10. Express the transfer function of PID controller.

PART - B (5 x 16 = 80 Marks)

11. (a) Determine the response of the system to a step change in set point. Assume T= 0.5 and D(z) is a PI control algorithm with $K_c = 0.43$, $\tau_i = 1.57$. The closed loop pulse transfer function of the system is:

$$\{C(z) / R(z)\} = \{D(z)\, G_{ho.}G_p(z)\} / \{1 + D(z)\, G_{ho.}G_p(z)\}. \quad (16)$$

Or

(b) Explain in about Hardware description of temperature control system with suitable block diagram. (16)

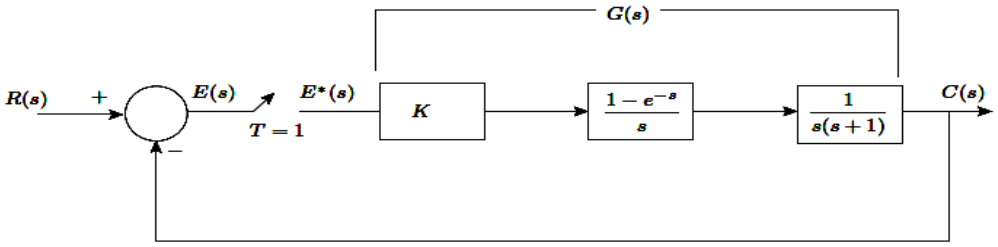
12. (a) (i) Derive the frequency response of ZOH device. (8)

(ii) Explain the advantages and disadvantages of sampled data control systems. (8)

Or

(b) Elaborate in detail about Ideal sampler process. (16)

13. (a) Determine the closed loop stability of the system shown in below figure when K = 1. (16)




Or

(b) Determine the stability of the sampled data control system represented by the following characteristic equation using Jury's stability test.
$Z^4 - 1.7Z^3 + 1.04Z^2 - 0.268Z + 0.024 = 0$ (16)

14. (a) Find out the three different canonical state variable models corresponding to the transfer function $G(z) = \dfrac{4z^3 - 12z^2 + 13z - 7}{(z-1)^2(z-2)}$. (16)

Or

(b) Determine the controllability and observability of the system

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix} \quad B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \quad C = [10 \quad 0 \quad 0]$$ (16)

15. (a) Explain with the help of block diagram digital temperature control system. (16)

Or

(b) Explain with the help of block diagram digital position control system. (16)