

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2018

Subject Code:2161007

Date:30/11/2018

Subject Name:Digital Control

Time: 02:30 PM TO 05:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

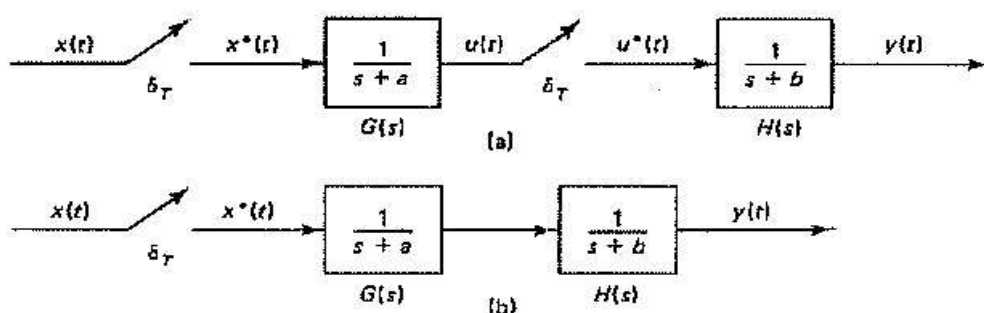
	MARKS
Q.1 (a) Find Z transform of unit step function.	03
(b) Explain in brief the operation of Sample and Hold operation.	04
(c) Explain Basic Block Diagram of Digital Control System.	07
Q.2 (a) Explain shifting Theorem of Z transform.	03
(b) Derive the Pulse Transfer Function of Closed Loop System.	04
(c) Explain the mapping of the left half of the s-plane into the z-plane.	07

OR

(c) Explain the Velocity Pulse Transfer Function of Digital PID Controller.	07
Q.3 (a) Obtain z transform of function $x(t) = t^2, 0 \leq t$.	03
(b) Find inverse z transform of following function using partial fraction expansion method.	04
$X(Z) = \frac{z - ze^{-aT}}{(z - 1)(z - e^{-aT})}$	
(c) State and prove the Final value and Initial value theorem.	07

OR

Q.3 (a) Explain the Impulse sampling.	03
(b) Consider the system shown in below figure (a) and (b). Obtain Pulse Transfer Function $Y(z)/X(z)$ for each of these two systems.	04



(c) Explain Block Diagram realization of a Filter Showing Direct Programming.	07
Q.4 (a) Define term Similarity transformations.	03
(b) Explain Jury's stability test with necessary condition of stability.	04
(c) List the different canonical representation. Explain any two canonical forms for Discrete time State Space Equation.	07

- Q.4** (a) Define following term. 03
1. State variables, 2. State space 3. State vector.
- (b) Explain the controllability and observability. 04
- (c) Explain Stability Analysis by use of the Bilinear Transformation and Routh Stability Criterion. 07
- Q.5** (a) Explain necessary and sufficient condition for state Observations. 03
- (b) State general rules to construct Root Loci. 04
- (c) Explain Optimal Regulator System based on a Quadratic Performance Index. 07
- OR**
- Q.5** (a) Explain stability improvement by state feedback. 03
- (b) Explain the Discretization of Continuous time State-Space Equation. 04
- (c) Explain Quadratic Optimal Control Problem. 07

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