	Utech
Name:	
Roll No.:	One Of Executing and Execution
Invigilator's Signature :	

CS/M.TECH (EE)/SEM-2/CAM-204(C)/2013 2013

DIGITAL CONTROL SYSTEM

Time Allotted: 3 Hours Full Marks: 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions. $5 \times 14 = 70$

- 1. a) What are the methods of testing the stability of digital control system? Explain any one.
 - b) Consider the characteristic polynomial:

$$F_1(Z) = 2Z^4 + 7Z^3 + 10Z^2 + 4Z + 1.$$

Test the stability by Jury.

6 + 8

2. Find the Z-transform of the following:

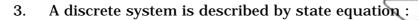
4 + 5 + 5

- a) $k^2 a^k$
- b) $e^{-at}\cos \omega t$

c)
$$H(s) = \frac{a}{s(s+a)}$$
.

30120 (M.Tech)

[Turn over



$$X_{1}(K+1) = \frac{1}{4}x_{1}(K) + u(K)$$

 $X_{2}(K+1) = \frac{1}{8}x_{1}(K) + \frac{1}{8}x_{2}(K) + u(K)$

and the output
$$y(K) = \frac{1}{2} x_1(K)$$
.

Solve for the output y (K) when u (K) is unit impulse and x (0) = 0.

4. Find the inverse Z-transform of the following: 5 + 5 + 4

a)
$$\frac{2Z^2}{(Z+2)^2(z+1)}$$

b)
$$\frac{(3Z^2+2Z+1)}{(Z^2-3Z+2)}$$

c)
$$\frac{(Z-4)}{(Z-1)(z-2)^2}$$

5. a) Determine the first few terms of the sequence by infinite power series method of the sequence f(K) when

$$F(Z) = \frac{\left(z^2 + z\right)}{\left(z^2 - 2z + 1\right)}$$

b) Let
$$C(z) = \frac{AT}{Z - (1 - AT)} R(Z)$$

Find C(K) if input is discrete step.



- 6. a) State the properties of state transition matrix in digital control.
 - b) Obtain state transition matrix of the following system :

$$A = \begin{bmatrix} 0 & 1 \\ -12 & 7 \end{bmatrix}.$$
 4 + 10

7. A discrete time system is described by the state equation

$$y(K+2) + 5y(K+1) + 6y(K) = u(K)$$

 $y(0) = y(1) = 0, T = 1 \text{ sec.}$

- a) Determine a state model in canonical form.
- b) Find state transition matrix. 7 + 7
- 8. Write short notes on any *two* of the following : 2×7
 - a) Digital PID controller
 - b) Transfer function of hold circuit
 - c) Digital compensator design using frequency response plot
 - d) Digital control system.