Manmohan Technical University Office of the Controller of Examinations **Exam Year: 2081, Mangsir(Model Question)**	**Exam Roll:** …… Exam Roll in words: ……	
School: SOE	Level: BE	Invigilator's Sign: ……
Program: BEEE	Year/Part: III/I	Superintendent's Sign: ……
Subject: DIGITAL CONTROL SYSTEM(EG602EX)		Code No. ……

i. Answers should be given by filling the Multiple-Choice Questions' Answer Sheet.
ii. The main answer sheet can be used for rough work.

Code No.

GROUP A *(Multiple-Choice Questions)*	**[10x1=10]**	**Time: 20 Minutes**

1. The quantization level is calculated in terms of Full-Scale Range as:
   a) $\frac{FSR}{2^{n-1}}$
   b) $\frac{FSR}{n-1}$
   c) $\frac{FSR}{2^n}$
   d) $\frac{FSR}{n}$
2. Which of the following is not a type of Analog to Digital Converter?
   a) Successive Approximation
   b) R-2R Ladder
   c) Flash
   d) Integrating
3. The Z-Transform of unit step function is
   a) $\frac{1}{z-1}$
   b) $\frac{z-1}{z}$
   c) $\frac{1-z^{-1}}{z^{-1}}$
   d) $\frac{z^{-1}}{1-z^{-1}}$
4. The settling time of a second order system excited with unit step input is:
   a) $\frac{\pi}{\omega_d}$
   b) $\frac{1}{\xi\omega_n}$
   c) $\frac{4}{\xi\omega_n}$
   d) $\frac{\pi-\theta}{\omega_d}$
5. The value of $\lim_{z\to 1}(1-z^{-1})\,X(z)$ gives:
   a) $\lim_{k\to\infty} kt$
   b) $\lim_{k\to 0} kt$
   c) $\lim_{k\to\infty} x(kT)$
   d) $\lim_{k\to 0} x(kT)$
6. The z-plane map of a horizontal line $s = j\omega_1$ represents
   a) A circle with radius $e^{T\omega_1}$
   b) A Straight line with slope angle $T\omega_1$
   c) A Vertical line
   d) A Horizontal line
7. The condition for a system to be stable in z-plane is:
   a) Z-plane poles must lie on left and z-plane
   b) Z-plane poles must lie within unit circle
   c) No zeros on Z-plane
   d) Only one pole in Z-plane
8. The Transfer function of a Zero-order Hold Circuit is
   a) $\frac{1}{s(s+1)}$
   b) e^{Ts}
   c) $\frac{s}{1-e^{-s}}$
   d) $\frac{1-e^{-s}}{s}$
9. The expression for pulse transfer function matrix from state equations is:
   a) $C(zI-G)^{-1}H+D$
   b) $(zI-G)^{-1}$
   c) $C(zI-G)^{-1}H$
   d) $(zI-G)^{-1}+D$
10. The Z- Transform of the Convolution x(kt)*y(kt) is given by:
    a) X(z)*Y(z)
    b) X(z)+Y(z)
    c) X(z)/Y(z)
    d) X(z)Y(z)

Multiple Choice Questions' Answer Sheet

Marks Secured: _____
In Words: _____
Examiner's Sign: _____ Date: _____
Scrutinizer's Marks: _____
In Words: _____
Scrutinizer's Sign: _____ Date: _____

Corrected Fill
Ⓐ ● Ⓒ Ⓓ
Incorrected Fill
~~Ⓐ~~ Ⓑ ● Ⓓ ✓

1.	Ⓐ Ⓑ Ⓒ Ⓓ		6.	Ⓐ Ⓑ Ⓒ Ⓓ	
2.	Ⓐ Ⓑ Ⓒ Ⓓ		7.	Ⓐ Ⓑ Ⓒ Ⓓ	
3.	Ⓐ Ⓑ Ⓒ Ⓓ		8.	Ⓐ Ⓑ Ⓒ Ⓓ	
4.	Ⓐ Ⓑ Ⓒ Ⓓ		9.	Ⓐ Ⓑ Ⓒ Ⓓ	
5.	Ⓐ Ⓑ Ⓒ Ⓓ		10.	Ⓐ Ⓑ Ⓒ Ⓓ	

Manmohan Technical University
Office of the Controller of Examinations
Exam Year: 2081, mangsir

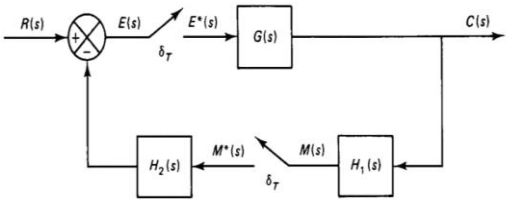
School: SOE	Level: BE	Time: 3 Hours
Program: BEEE	Year/Part: III/I	Full Marks: 50
Subject: : DIGITAL CONTROL SYSTEM(EG602EX)		

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

GROUP A *(Multiple-Choice Questions in separate paper)* **[10×1=10]**

GROUP B ***(****Short Answer Questions - **Attempt Any Eight Question)*** **[8×2=16]**

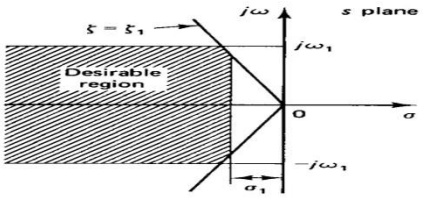
1. Explain the block diagram of Digital Control System.
2. Find the Z- Transform of $X(s) = \frac{s-1}{s(s+1)}$
3. State and prove the Left Shifting Theorem of Z-transform.
4. Convert the s-plane with constant damping ratio (ξ) line into z-plane map.
5. What are the stability conditions for the closed loop system in a Z-plane?
6. Obtain the block diagram of a digital filter which is represented by a function:
$$G(z) = \frac{2 - 0.6z^{-1}}{1 + 0.5z^{-1}}$$
7. Find the state transition matrix if $G = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix}$
8. Discuss the advantages of Digital PID controllers.
9. Obtain the Closed Loop Pulse Transfer Function of the following system



[6×4=24]

GROUP C ***(****Long Answer Questions – **Attempt Any Six Questions)***

10. Explain the process of reconstructing an original signal from a sampled signal. **[4]**
11. Obtain x(kT) if $X(z) = \frac{z^2}{(z-1)^2(z-e^{-aT})}$
12. Solve the differential equation:
$2x(k) - 2x(k-1) + x(k-2) = u(k)$ where x(k)=0 for k<0. **[4]**
13. Convert the shaded region shown in the figure in s-plane into z-plane.



[4]

14. A Control System has the following characteristic equation. Determine the stability of the system. $P(z) = z^3 - 1.3z^2 - 0.08z + 0.24 = 0$ **[4]**
15. When a second order control system is subjected to a unit step input, the values of $\xi = 0.5$ and $\omega_n = 6$ rad/sec. Determine rise time and maximum overshoot. **[4]**
16. Obtain the State Space Representation of the following Pulse Transfer Function System: **[4]**

THE END