

DipIETE – ET (Current Scheme)

Time: 3 Hours

JUNE 2017

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

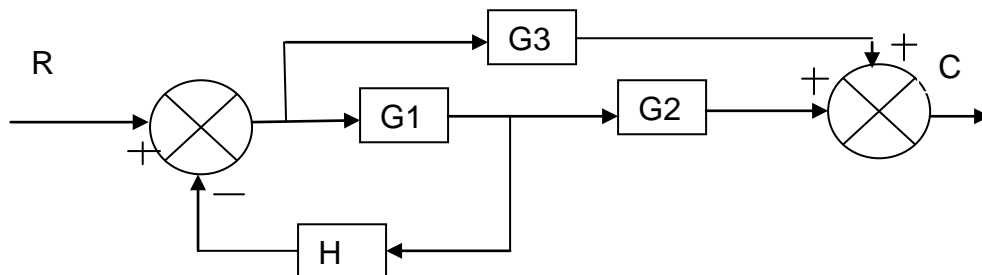
Q.1 Choose the correct or the best alternative in the following: (2×10)

- a. In Speed Control Systems, the device used for providing feedback is
 (A) Thermocouple (B) Synchro –transmitter
 (C) Synchro –transformer (D) Tacho-generator
- b. The Closed loop control systems
 (A) Increases the accuracy (B) are unreliable
 (C) are easier to construct (D) are affected by noise
- c. The Laplace Transform of unit step input is
 (A) $\frac{1}{s^2}$ (B) $\frac{1}{s+1}$
 (C) $\frac{1}{s}$ (D) $\frac{1}{(s+1)^2}$
- d. The system will reach its steady state response
 (A) When $t = 0$
 (B) When $t \rightarrow \infty$
 (C) When $t \leq 0$
 (D) When the input changes from zero to one
- e. The impulse response of $h(t) = e^{-t}$ is
 (A) decays to zero (B) Exponentially increasing
 (C) constant (D) Oscillatory
- f. The transfer function of a system is given as $G(s) = \frac{200}{s^2 + 20s + 200}$ the System
 is
 (A) An Over damped System (B) An under-damped system
 (C) A critically damped System (D) An Undamped system

- g. Time taken by the response to reach and stay within 2% or 5% of the final value is known as _____.
- (A) Peak Time (B) Rise Time
(C) Delay Time (D) Settling Time
- h. When unit step input is given to type 0 system what is the steady state error?
- (A) Zero (B) constant
(C) Infinite (D) Indeterminate
- i. Usually the polar plot is drawn for
- (A) Nonlinear systems only (B) Feedback control systems only
(C) Open loop system (D) Unstable system
- j. In most cases for the stability of Control system the gain margin should be
- (A) Zero (B) Less than zero
(C) Greater than one (D) a complex number

**Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.**

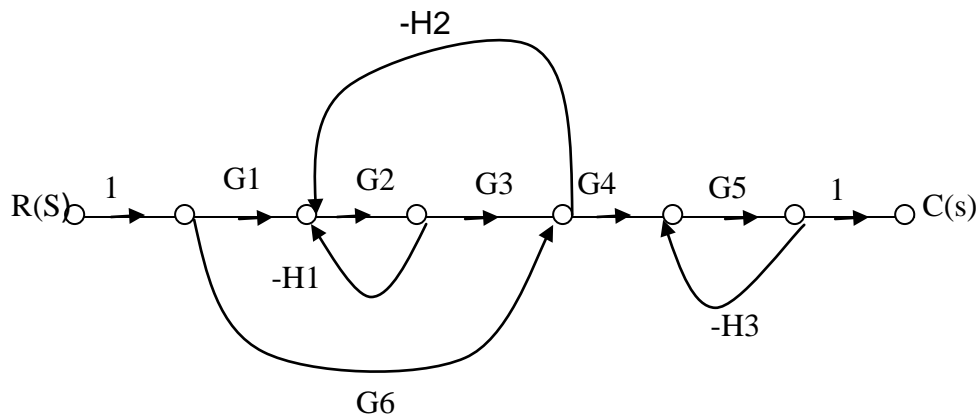
- Q.2** a. What is open loop and closed loop control system? Explain the terminology of the closed loop with help of block diagram. (10)
- b. Explain the characteristics of feedback control system. (6)
- Q.3** a. Explain the steady state and transient responses. (4)
- b. What are the various standard Test Signals? (6)
- c. Find out the inverse Laplace transform of $\frac{4}{s(s+1)(s+4)}$ (6)
- Q.4** a. Using Routh criterion, determine the stability of the system represented by the characteristics equation, $s^4 + 8s^3 + 18s^2 + 16s + 5 = 0$. (8)
- b. Reduce the following block diagram and find the overall transfer function. (8)



Code: DE65

Subject: CONTROL ENGINEERING

- Q.5 a. Explain signal flow graph algebra with suitable examples. (6)
 b. Find the overall transfer function $C(s)/R(s)$. (10)



- Q.6 a. For the Unity feedback control system the open loop transfer function $G(s) = \frac{10(s+2)}{s^2(s+1)}$. Find the position, velocity and acceleration error constants. (8)
 b. Classify and explain the continuous feedback system by type. (8)
- Q.7 a. Explain the Properties of Mapping $P(s)$ or $P(z)$. (7)
 b. Write short notes on Nyquist Stability Criterion. (4)
 c. Write short notes on Relative Stability. (5)
- Q.8. a. A Unity feedback control has an open loop transfer function $G(s) = \frac{K}{s(s^2 + 4s + 13)}$. Sketch its root locus. (12)
 b. Find the breakaway point of $G(s) = \frac{K}{s(s+2)(s+4)}$. (4)
- Q.9 a. Define Corner frequency, Gain Cross Over frequency and Phase cross over frequency. (6)
 b. Plot the bode diagram for the transfer function $G(s) = \frac{10}{s(1+0.4s)(1+0.1s)}$. (10)