DipIETE – ET (OLD SCHEME)

Code: DE15 **JUNE 2009** **Subject: CONTROL ENGINEERING**
Time: 3 Hours **Max. Marks: 100**

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.**
- **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 terms of Bode plot, the system is stable if

(A) PM = GM **(B)** PM and GM, both positive
(C) PM and GM, both negative **(D)** PM negative but GM positive

b. The lag compensation in control system is achieved by

(A) Adding zeros in the transfer function
(B) adding poles in the transfer function
(C) Both **(A)** and **(B)**
(D) none of these

c. Consider the function $F(s)=\frac{5}{s(s^2+s+2)}$ where $F(s)$ is laplace transform of $f(t)$. $\lim_{t\to\infty} f(t)$ is equal to

(A) 5/2 **(B)** one
(C) zero **(D)** none of the above

d. As compared to closed loop system, an open loop system is :

(A) More stable as well as more accurate
(B) less stable as well as less accurate
(C) More stable but less accurate
(D) less stable but more accurate

e. The eigen value of the matrix $A=\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}$

(A) –1, –2, –3 **(B)** 0, –3, –4
(C) 0, 0, –4 **(D)** None of the above

f. In the control system shown in Fig 1, the controller which can give zero steady state error to a ramp input, with K=9 is

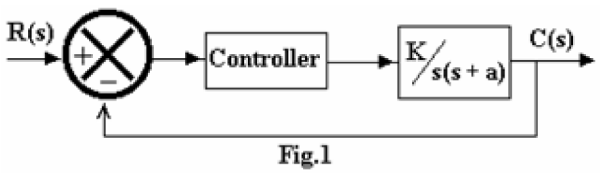


Fig.1

(A) proportional type
(B) integral type
(C) derivative type
(D) proportional plus derivative type

g. The output response of a linear system is the system transfer function when the input is:

(A) a step signal **(B)** a ramp signal

(C) an impulse signal **(D)** a sinusoidal signal

h. When the signal flow graph is shown in the Fig.2, the overall transfer function will be

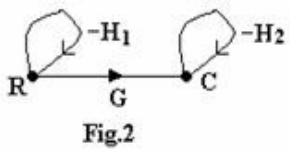


Fig.2

(A) $\frac{C}{R} = G$ **(B)** $\frac{C}{R} = \frac{G}{1+H_2}$

(C) $\frac{C}{R} = \frac{G}{(1+H_1)(1+H_2)}$ **(D)** $\frac{C}{R} = \frac{G}{1+H_1+H_2}$

i. For the critically damped condition, the damping ratio is

(A) Zero **(B)** equal to one
(C) Any value greater than one **(D)** any value less than one

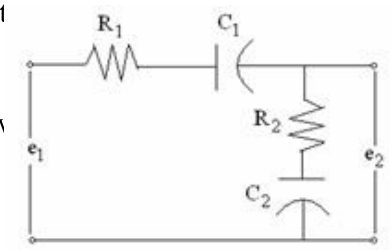
j. In position control system, the device used for providing rate feedback voltage is called

(A) Potentiometer **(B)** synchro-transmitter
(C) synchro-receiver **(D)** tachogenerator

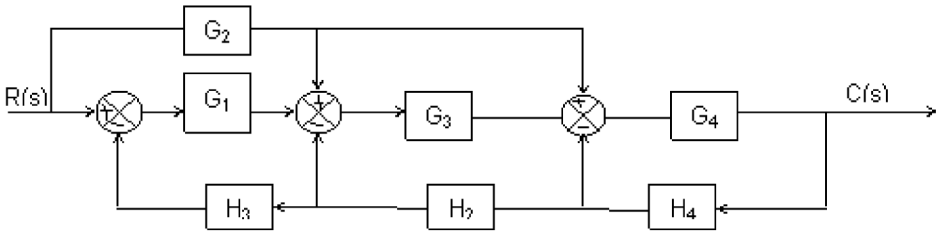
Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. Distinguish between the following: **(6)**
(i) Static and Dynamic system (ii) Closed loop and Open loop system
(iii) Linear and non-linear syst

b. Use force voltage analogy work for the electrical network given belo **0)**



Q.3 a. Figure given below is a block diagram of a linear feedback system. Obtain a signal flow graph for the system and hence obtain overall gain by using mason's gain formula. **(10)**



b. Describe the principle of operation of LVDT. **(6)**

Q.4 a. A second order control system is represented by a transfer function given below :

$$\frac{\theta_o(s)}{T(s)} = \frac{1}{Js^2 + fs + K}$$