Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[4957]-1047

S.E. (E&TC/Electronics) (II Sem.) EXAMINATION, 2016

CONTROL SYSTEM

(2012 PATTERN)

Time : Two Hours **Maximum Marks : 50**

***N.B.* :—** (*i*) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** and Q. **7** or Q. **8**.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Assume suitable data, if necessary.

(*vi*) Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam table is allowed.

(*v*) Figures to the right indicate full marks.

1. (*a*) Write short note on Stepper Motor. [6]

(*b*) A unity feedback system has, $G_{(s)} = \frac{K}{s(s+1)(1+0.45s)}$

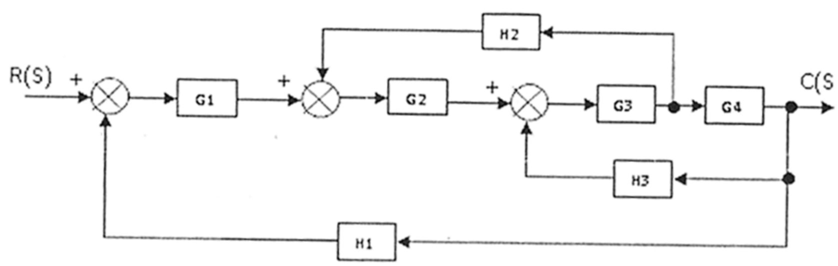
(*i*) If $r(t) = 4t$ and K = 2, find steady state error.

(*ii*) If the desired value of steady state error to be 0.2, find corresponding value of K. [6]

P.T.O.

Or

2. (*a*) Reduce the following block diagram and obtain $\frac{C_{(s)}}{R_{(s)}}$. [6]



(*b*) For the system with transfer function $\frac{1}{(s+3+7j)(s+3-7j)}$ find peak time and maximum peak overshoot. [6]

3. (*a*) Find range of K so that the system will be stable using Routh-Hurwitz criterion for the characteristic Equation :

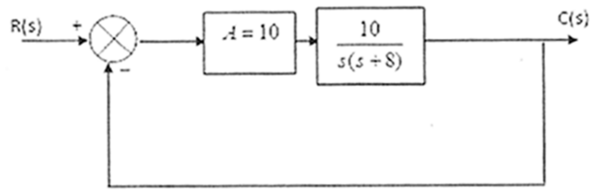
$$D(s) = s^4 + 5s^3 + 5s^2 + 4s + K = 0$$ [4]

(*b*) Draw Bode Plot for unity feedback system given by $G(s) = \frac{40\,(s+5)}{s(s+2)\,(s+10)}$ and comment on stability. [8]

Or

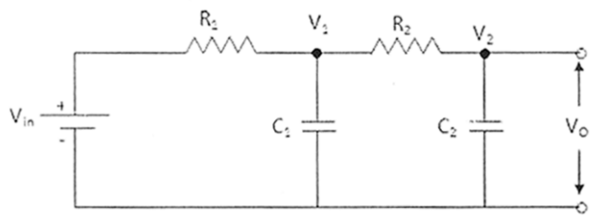
4. (*a*) An unity feedback system has the open loop transfer function $G(s) = \frac{K}{s(s+1)\,(s+3)\,(s+4)}$ Sketch complete root locus and comment on stability. [8]

(*b*) Figure below shows schematic diagram of unity feedback control system, calculate ω_r and M_r.



[4]

5. (*a*) Find state model of following Electrical network. [6]



(*b*) Consider a system having state model

$$\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \end{bmatrix} = \begin{bmatrix} -2 & -3 \\ 4 & 2 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} + \begin{bmatrix} 3 \\ 5 \end{bmatrix} \cup \text{ and } Y = \left[[1 \;\; 1] \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} \right] \text{ with } D = 0.$$

Obtain its transfer function. [7]

Or

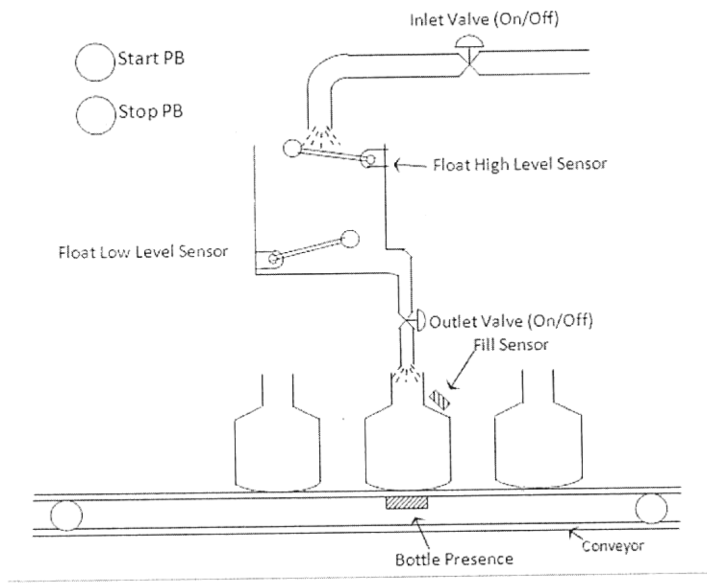
6. (*a*) Find controllability and observability of the system described by state equation : [6]

$$\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \end{bmatrix} = \begin{bmatrix} 3 & 0 \\ 2 & 4 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} \cup \qquad Y = [[1 \;\; 0]x]$$

(*b*) Write short note on state transition matrix and its properties. [7]

7. (*a*) Explain digital control system with its advantages. [6]

(*b*) Draw a PLC ladder diagram for the bottle filling system as shown in figure below. [7]



Or

8. (*a*) Write short note on PID controllers. [6]

(*b*) Obtain the pulse transfer function of the system shown in figure. [7]