Model Question Paper (CBCS) with effect from 2015-16

15ME73

USN | | | | | | | | | | |

Seventh Semester B.E. Degree (CBCS) Examination

Control Engineering

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

MODULE – I

1 **a** What are the requirements of Ideal control system? (08 Marks)

b Differentiate between open loop and closed loop control system with an example for each. (08 Marks)

OR

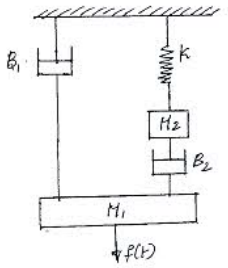
2 **a** What is control action? Explain proportional plus integral and proportional plus derivative controller. (08 Marks)

b With neat block diagram, explain proportional and integral controllers. (08 Marks)

MODULE – II

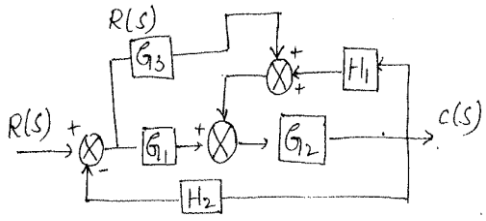
3 **a** Obtain the transfer function of field controlled DC motor. (08 Marks)

b Write the differential equations governing the mechanical system shown figure. Also draw F-V and F-I analogous circuits. (08 Marks)

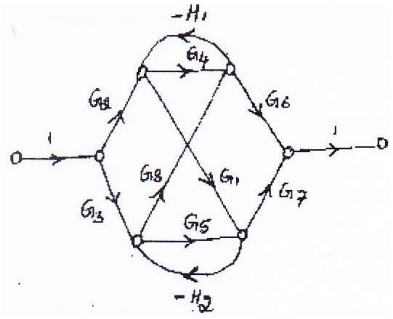


OR

4 **a** Reduce the block diagram in fig and obtain its transfer function. (08 Marks)



b Obtain the overall transfer function for the given SFG. (08 Marks)



MODULE – III

5 **a** A system has the following transfer function, (10 Marks)

$$\frac{C(s)}{R(s)} = \frac{20}{s+10}$$

Determine its unit impulse, step and ramp response with zero initial conditions. Sketch the responses

b Derive an expression for response of 1st order system for unit step input (06 Marks)

OR

6 **a** A feedback control system has open loop transfer function $G(s)H(s) = \frac{K}{s(s+4)(s^2+4s+20)}$. Plot the root locus for K = 0 to ∞. Indicate the points on it. (16 Marks)

MODULE – IV

7 **a** Draw the Nyquist plot for a given control system, G(s)H(s) = $\frac{K}{s(s+2)(s+10)}$ .Determine the range of K for which the system is stable (16 Marks)

OR

8 **a** Sketch the Bode plot for the transfer function and determine the value of K for gain cross over frequency of 5 rad/s. $G(s)H(s) = \frac{Ks^2}{(1+0.2s)(1+0.02s)}$. (16 Marks)

MODULE – V

9 **a** The system is represented by a differential equation $y''' + 6y'' + 12y' + 10y = 4u$, where y is the output and u is the input of the system. Obtain the state space equation. (08 Marks)

b Define the terms (i) Controllability of a system, (b) State of a system, (c) State vector, (d) Observability of a system. (08 Marks)

OR

10 **a** Consider the system defined by $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix} = \begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -6 & -11 & -6\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix} + \begin{bmatrix}1\\ 0\\ 1\end{bmatrix}u(t)$ (10 Marks)

$Y = \begin{bmatrix}10 & 5 & 1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}$. Check the controllability and observability of the system using Gilbert's test.

b Define compensator. Explain in brief feedback compensator with the help of block diagram. (06 Marks)