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** With an example for both explain the working of open loop and closed loop control systems. (08 Marks)

b List the advantages and disadvantages of open loop and closed loop control systems. (08 Marks)

OR

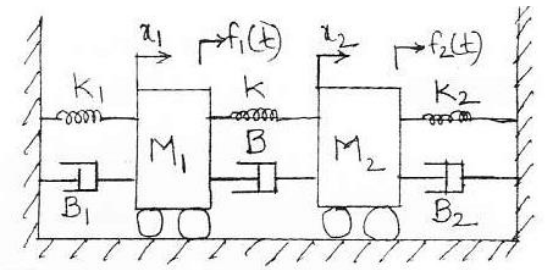
2 **a** Explain the requirements of Ideal control system (08 Marks)

b With help of block diagram explain proportional plus integral controller. (08 Marks)

MODULE – II

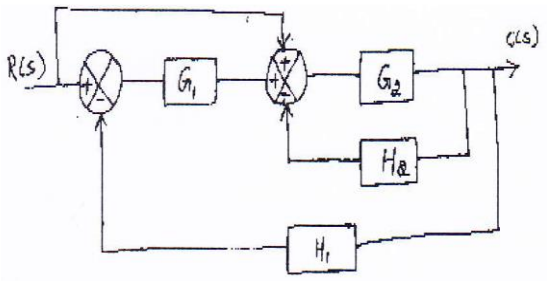
3 **a** Obtain the transfer function of armature controlled DC motor. (08 Marks)

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

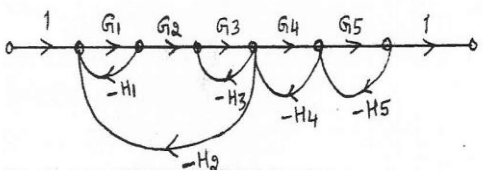


OR

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** Sketch the root locus plot for $G(s)H(s) = \frac{K}{s(s+2)(s+4)(s+6)}$. For what values of K the system becomes unstable. (16 Marks)

MODULE – IV

7 **a** Draw the Nyquist plot for a given open loop transfer function, G(s)H(s) = $\frac{5}{s(1-s)}$. Comment on stability of the control system. (16 Marks)

OR

8 **a** Sketch the Bode plot for the transfer function $G(s)H(s) = \frac{75(1+0.2s)}{s(s^2+16s+100)}$. (16 Marks)

MODULE – V

9 **a** Explain the series compensation with neat block diagram. (06 Marks)

b Construct a state model using phase variables if the system is described by the differential equation $y'''(t) + 4y''(t) + 7y'(t) + 2y(t) = 5u(t)$. (10 Marks)

OR

10 **a** Define the following terms (a) state variables, (b) state space, (d) state trajectory (06 Marks)

b Find the observability of the state model using Kalman's test and Gilbert's test (10 Marks)

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix} = \begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ 0 & -2 & -3\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix} + \begin{bmatrix}0\\ 0\\ 1\end{bmatrix}, \quad Y = \begin{bmatrix}3 & 4 & 1\end{bmatrix}\begin{bmatrix}x_1\\ x_2\\ x_3\end{bmatrix}$$