

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

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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

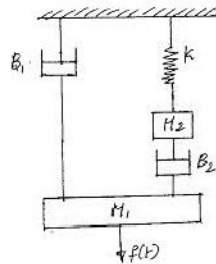
- 1 a What are the requirements of Ideal control system? (08 Marks)
- b Differentiate between open loop and closed loop control system with an example for each. (08 Marks)

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)

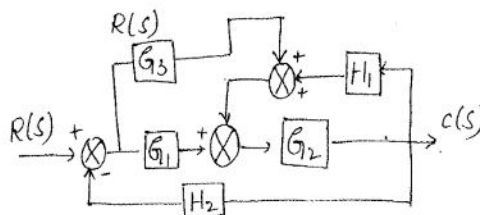
MODULE – II

- 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)

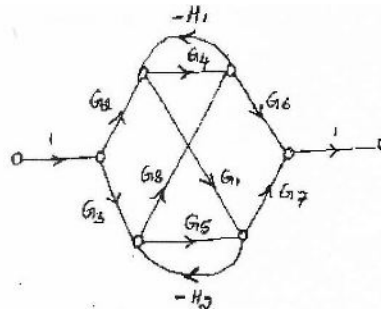


OR

- 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)

Important Note: 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. 2. Any revealing of identification, appeal to evaluator and/or equations written e.g., 38+2 = 40, will be treated as malpractice.

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

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)

$Y = [10 \ 5 \ 1] \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$. 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)