CBCS SCHEME

USN | | | | | | | | | |

15MA73

Seventh Semester B.E. Degree Examination, June/July 2019
Control Engineering

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. With the help of a block diagram explain :
(i) PI and
(ii) PID **(10 Marks)**

b. With reference to feedback control system define the following terms with examples.
(i) Command input
(ii) Reference input
(iii) Forward path
(iv) Feedback path. **(06 Marks)**

OR

2 a. List the advantages and disadvantages of (i) Proportional control (ii) Integral Controller. **(08 Marks)**

b. Define open loop and closed loop system by giving suitable example and differentiate between open loop and closed loop system. **(08 Marks)**

Module-2

3 a. Write the differential equations governing the mechanical systems shown in Fig Q3(a), Also F-V and F-C analogous circuits.

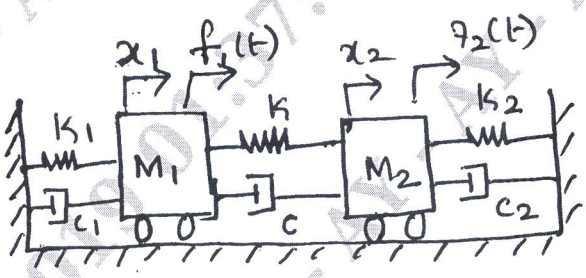

Fig Q3(a)

b. Explain the significance of a transfer function stating its advantages and features. **(12 Marks) (04 Marks)**

OR

4 a. Reduce the block diagram to its simple form and obtained transfer function.[Refer Fig Q4(a).

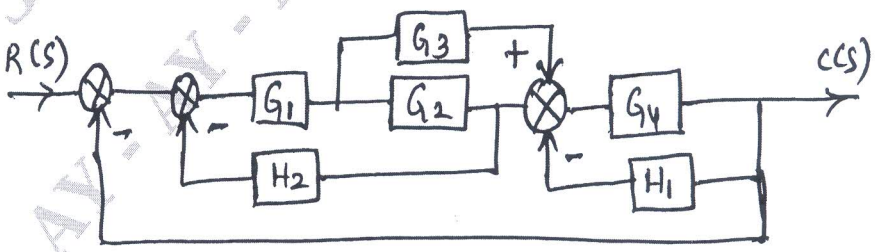

Fig Q4(a) **(08 Marks)**

b. Obtain the overall transfer function $\frac{C(s)}{R(s)}$ of the SFG given in Fig Q4(b).

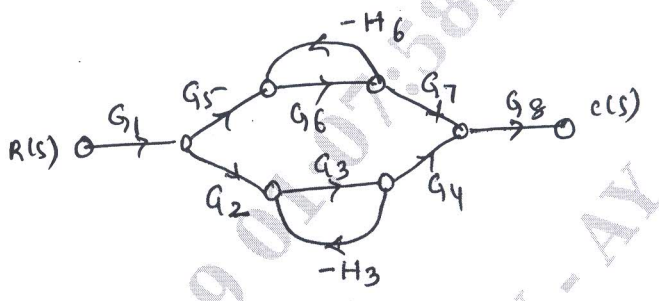

Fig Q4(b) **(08 Marks)**

Module-3

5 a. Solve the equation $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} = 4$ with $y = 0$ and $\frac{dy}{dt} = 6$ when $t = 0$. **(06 Marks)**

b. Define: i) Delay time ii) Rise time iii) Peak time iv) Peak over shoot v) Settling time. **(05 Marks)**

c. Using R.H criterion, determine the stability of the system represented by the characteristic equation $3s^6 + 14s^5 + 24s^4 + 84s^3 + 60s^2 + 112s + 48 = 0$. **(05 Marks)**

OR

6 Sketch the root locus for the following system having

$$G(s)H(s) = \frac{1}{s(s+3)(s^2+3s+4.5)}$$ **(16 Marks)**

Module-4

7 A unity feedback control system has $G(s) = \frac{80}{s(s+2)(s+20)}$. Draw the bode plot. Determine Gain margin, phase margin Gain cross over frequency, phase cross over frequency. **(16 Marks)**

OR

8 For a certain control system $G(s)H(s) = \frac{k}{s(s+2)(s+10)}$. Sketch the Nyquist plot and calculate the range of values of K for stability. **(16 Marks)**

Module-5

9 a. What is system compensation? What series and feedback compensation? **(08 Marks)**

b. For the given Transfer function of a system obtain the state model by direct decomposition $T(s) = \frac{(s+2)(s+3)}{s(s+1)(s^2+9s+20)}$. **(08 Marks)**

OR

10 a. Explain the following terms with examples (i) controllability (ii) observability. **(05 Marks)**

b. Define: (i) State (ii) State variables (iii) State space (iv) State trajectory (v) State vector. **(05 Marks)**

c. Consider a system having state model $\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix} = \begin{bmatrix}-2 & -3\\ 4 & 2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix} + \begin{bmatrix}3\\ 5\end{bmatrix}$ & $y = [1\ 1]\begin{bmatrix}x_1\\ x_2\end{bmatrix}$

With $D = 0$, obtain its transfer function. **(06 Marks)**

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