CBCS SCHEME

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17ME73

Seventh Semester B.E. Degree Examination, June/July 2023
Control Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Sketch the basic components present in open loop and closed loop control systems. **(08 Marks)**

b. What are the characteristics of Negative feedback? Why are they preferred? **(08 Marks)**

c. Distinguish between Linear and Non-Linear control system. **(04 Marks)**

OR

2 a. Define : (i) Proportional controller. (ii) Derivative controller
(iii) Integral controller (iv) P.I.D controller **(08 Marks)**

b. Describe the effect of various controllers on system performance. **(12 Marks)**

Module-2

3 a. Find the transfer function $\frac{Q_1(s)}{T(s)}$ of the given mechanical rotational system.

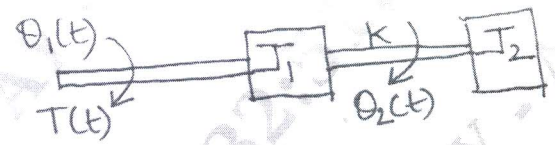

Fig. Q3 (a) **(10 Marks)**

b. Draw the F-V and F-C analogous circuit for the given system :

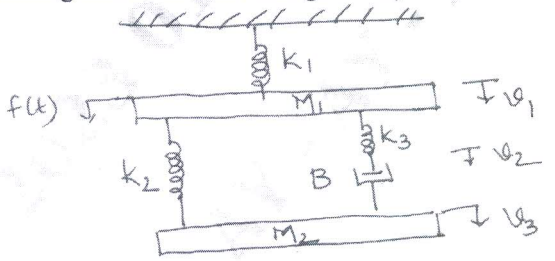

Fig. Q3 (b) **(10 Marks)**

OR

4 a. Using Reducing technique, obtain overall transfer function of the block diagram shown in Fig. Q4 (a)

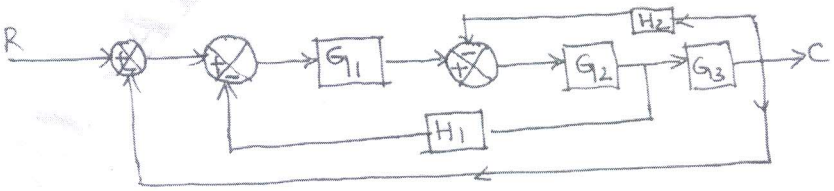

Fig. Q4 (a) **(10 Marks)**

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

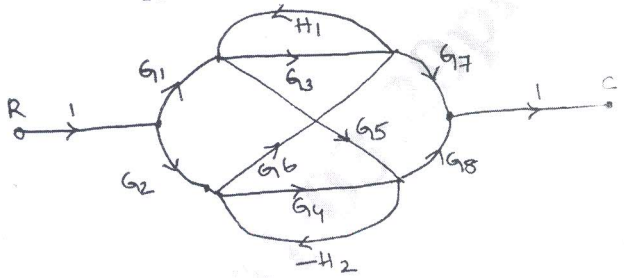

Fig. Q4 (b) **(10 Marks)**

Module-3

5 a. Define : (i) Time response (ii) Transient response. (iii) Steady-state response **(08 Marks)**

b. Consider the system shown in Fig. Q5 (b), where $\xi = 0.5$, $\omega_n = 4$ rad/sec. Find
(i) ω_d (ii) t_r (iii) t_P (iv) M_P (v) t_s

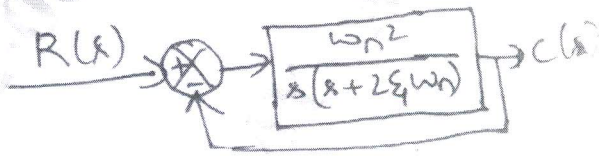

Fig. Q5 (b) **(12 Marks)**

OR

6 Sketch the Root locus for the system with unity feedback system and whose open loop transfer function is $G(s) = \frac{K}{s(s^2+6s+10)}$. **(20 Marks)**

Module-4

7 Sketch the Bode plot for the following transfer function and determine GM and PM.
$G(s) = \frac{75(1+0.2s)}{s(s^2+16s+100)}$. **(20 Marks)**

OR

8 Sketch the Nyquist plot and therefore determine the stability of the closed loop system whose open loop transfer function is given by, $G(s)H(s) = \frac{K}{s(s^2+s+2)}$. **(20 Marks)**

Module-5

9 a. What is a Lead compensator and Lag compensator? When are they preferred? **(08 Marks)**

b. Obtain the transfer function of the system :

$$\begin{Bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{Bmatrix} = \begin{bmatrix} -5 & -1 \\ 3 & -1 \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \end{Bmatrix} + \begin{Bmatrix} 2 \\ 5 \end{Bmatrix} u \text{ and } y = \begin{bmatrix} 1 & 2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}.$$ **(12 Marks)**

OR

10 Transfer function of a system is given by :
$\frac{Y(s)}{U(s)} = \frac{2}{s^3+6s^2+11s+6}$ by Gilberts test. **(20 Marks)**

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