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Seventh Semester B.E. Degree Examination, Jan./Feb. 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. With a block diagram, explain automobile speed closed control system. **(10 Marks)**
   b. List and explain requirements of an ideal control system. **(10 Marks)**

OR

2 a. Explain: (i) Proportional controller   (ii) Derivative controller **(10 Marks)**
   b. Obtain transfer function for armature controlled D-C motor. **(10 Marks)**

Module-2

3 a. Explain typical test signals in control system. **(10 Marks)**
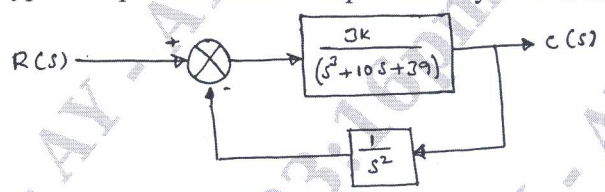   b. Determine order and type for open and closed loop control system as shown in Fig.Q3(b).

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

OR

4 a. Define:
   (i) Delay time   (ii) Rise time   (iii) Peak time
   (iv) Maximum overshoot   (v) Setting time **(10 Marks)**

   b. A unity feedback system is characterized by open loop transfer function $G(s) = \dfrac{16}{s^2 + 2s + 16}$.

   Determine the following when the system subjected to unit step input :
   (i) Undamped not usual frequency   (ii) Damping ratio   (iii) Peak overshoot
   (iv) Peak time   (iv) Settling time **(10 Marks)**

Module-3

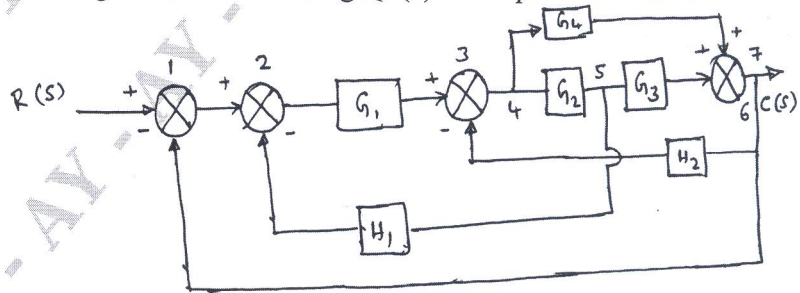5 a. Reduce the block diagram as shown in Fig.Q5(a) to simple form and find transfer function:

Fig.Q5(a) **(10 Marks)**

1 of 3

b. Obtain transfer function of block diagram shown in Fig.Q5(b) by reduction technique.
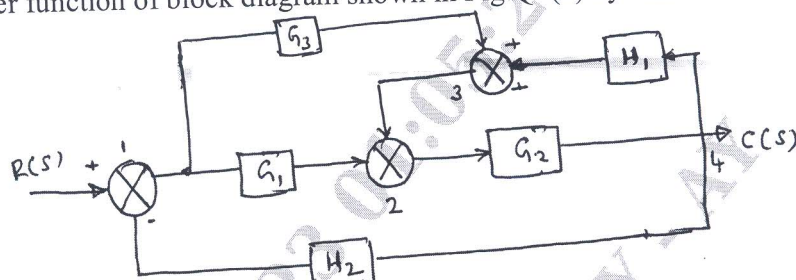

Fig.Q5(b)   **(10 Marks)**

OR

6 a. For the system shown in Fig.Q6(a), determine $\dfrac{C(s)}{R(s)}$ using Mason's gain formula.
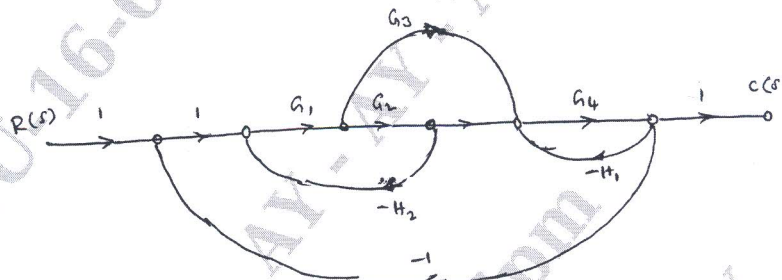

Fig.Q6(a)   **(10 Marks)**

b. Using SFG and Mason's gain formula, obtain the overall transfer function of system shown in Fig.Q6(b).
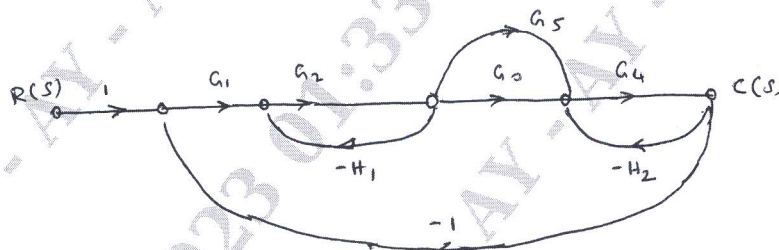

Fig.Q6(b)   **(10 Marks)**

Module-4

7 a. Applying Routh criterion, discuss the stability of closed loop system as function for open loop transfer function:

$$G(s)H(s) = \frac{K(s+1)}{s(s-1)(s^2+4s+16)}$$

(10 Marks)

b. Investigate the stability of system using Routh Hurwitz criterion having characteristic equation $s^5 + 4s^4 + 12s^3 + 20s^2 + 30s + 100 = 0$

(10 Marks)

OR

8 Sketch the root locus for negative feedback system whose open loop transfer function is given by $G(s)H(s) = \dfrac{K}{s(s+3)(s^2+3s+4.5)}$

(20 Marks)

Module-5

9 a. Sketch polar plot for transfer function $G(s) = \dfrac{10}{s(s+1)(s+2)}$. **(10 Marks)**

b. Open loop function control system $G(s)H(s) = \dfrac{1}{s^2(s+2)}$, sketch Nyquist plot and ascertain stability. **(10 Marks)**

OR

10 A unity feedback control system has $G(s) = \dfrac{80}{s(s+2)(s+20)}$. Draw the Bode plot if phase cross over occur at $\omega = 6.35$ rad/sec, find the corresponding gain margin. **(20 Marks)**

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