

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH] DECEMBER 2019

Paper Code: ETEL-307

Subject: Control System

Time : 3 Hours

Maximum Marks : 75

Note: Attempt any five questions including Q. No 1 which is compulsory.

Q1 Answer the following in brief:

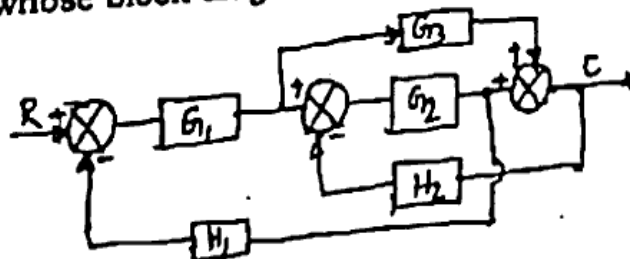
(2.5x10=25)

- ✓ a) Classify different types of control system.
- ✓ b) Discuss following test signals
 - (i) Impulse (ii) Step (iii) Ramp
- ✓ c) Flow servo motor is different from DC motor? Discuss.
- ✓ d) Define the damping ratio and explain how it affects the response of a system?
- ✓ e) Define Gain crossover frequency, phase crossover frequency, Gain margin and phase margin in bode plot?
- ✓ f) Define relative and absolute stability.
- g) What are static error coefficients?
- ✓ h) What do you mean by polar plot and Inverse polar plot?
- ✓ i) What is the purpose of a compensating network in a feed back control system.
- ✓ j) Write short note on frequency domain specifications

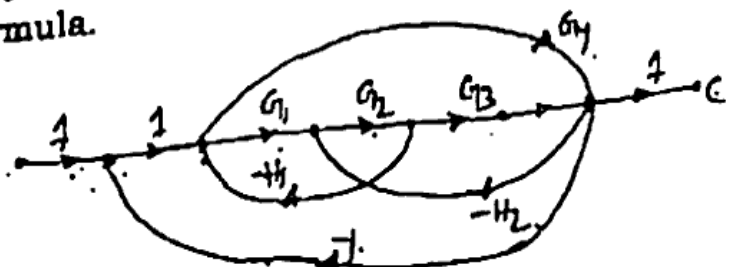
- Q2 ✓ a) Investigate the stability of a system having following characteristics equation using Routh-Hurwitz criterion: (6)
- $$s^6 + s^5 + 5s^4 + 3s^3 + 2s^2 - 4s - 18 = 0$$
- ✓ b) Examine the closed loop stability of a system whose open loop transfer function is given by (6.5)

$$G(s)H(s) = \frac{50}{(s+1)(s+2)} \quad (\text{by using nyquist criterion})$$

- Q3 a) Determine the overall transfer function relating C and R for the system whose block diagram is shown below. (6.5)



- ✓ b) Find the transfer function for the system shown below using mason's gain formula. (6)



P.T.O.

- Q4 Derive the expression for response of the first order system with step input and unit Ramp function (12.5)
- Q5 a) Sketch the bode-plot for the open loop transfer function given below with unity feedback and assess stability. (6.5)
- $$G(s) = \frac{50}{s(s+1)(s+2)}$$
- ✓ b) Sketch the polar plot for (6)
- $$G(s) = \frac{20}{s(s+2)(s+4)}$$
- Q6 a) The forward path transfer function of a unity feedback system is given by $G(s) = \frac{K}{s(s+4)(s+5)}$ (8)
- ✓ b) Sketch the root locus as K varies from Zero to infinity. (4.5)
- ✓ b) Explain different types of compensation used in control system. (4.5)
- Q7 a) Explain on detail the response of P, PI, PD and PID controller. (6)
- b) Derive the transfer function of a lead-lag network and write down the effects of this network. (6.5)
- Q8 Write short notes on: (4.5)
- a) Servo motors (4)
- b) Tacho generator (4)
- c) Synchros

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