

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VI • EXAMINATION – SUMMER • 2014

Subject Code: 161905

Date: 26-05-2014

Subject Name: Control Engineering

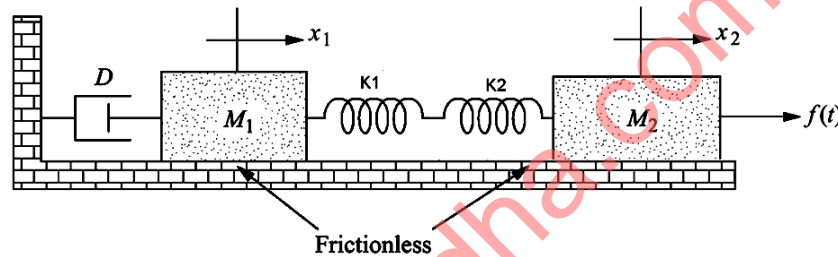
Time: 10:30 am - 01:00 pm

Total Marks: 70

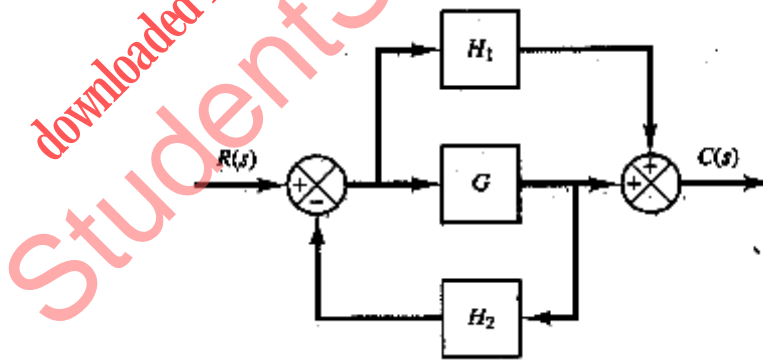
Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain the open-loop operation of traffic signals at a road crossing. How can improved traffic control be achieved by means of a closed-loop scheme? **07**
 What are the advantages and disadvantages of open loop and closed loop systems?
- (b) Write the differential equations governing the mechanical system. Derive transfer function of $x_1(s)/F(s)$. **07**

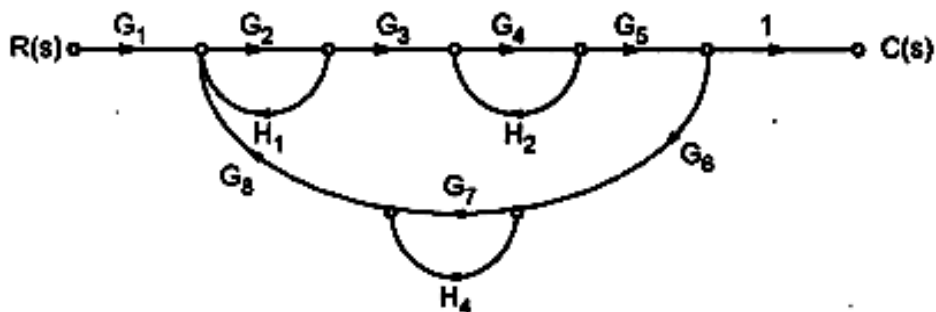


- Q.2** (a) Derive a transfer function for a liquid level system. Explain resistance and capacitance of any liquid level system. **07**
- (b) Obtain transfer functions $C(s)/R(s)$ of the system as shown in figure. State the initial step before obtaining the transfer function. **07**



OR

- (b) Determine the transfer function $C(s)/R(s)$ for the system shown in figure using Mason's gain formula. **07**



- Q.3 (a)** Draw a schematic diagram & block diagram for a hydraulic proportional plus derivative control system. Derive expression for transfer function for above mentioned hydraulic PD control systems. Explain how this can be converted to PID controller **07**
- (b)** What is FRL unit in pneumatic system? Write about pneumatic power sources. State various components used in pneumatic circuit. **07**

OR

- Q.3 (a)** Compare between hydraulic and pneumatic control systems. **07**
- (b)** Describe the working of a force distance type pneumatic proportional controller and its transfer function. **07**

- Q.4 (a)** Sketch the root locus plot of the system with **07**

$$G(s) = \frac{K}{s(s+1)(s+2)}, \quad H(s) = 1$$

- (b)** Explain unit step response of first order linear time invariant systems. **07**

OR

- Q.4 (a)** Using the Routh-Hurwitz criterion for simple design problems, consider that the characteristic equation of a closed-loop control system is **07**

$$s^3 + 3Ks^2 + (K+2)s + 4 = 0$$

Determine the desired range of K so that the system is stable.

- (b)** Explain following terms in regard to transient response specification of second order control system using neat sketch. **07**

- Delay time t_d
- Rise time t_r
- Peak time t_p
- Maximum overshoot M_p
- Settling time t_s

- Q.5 (a)** State applications of fuzzy control. Explain following terms, **07**
- Fuzzification
 - Fuzzy sets
 - Fuzzy membership functions

- (b)** Explain boiler feed control system using neat sketch. **07**

OR

- Q.5 (a)** Draw equivalent mechanical and electrical systems to relate force voltage or force current analogy. **07**

- (b)** What do you mean by micro-processor based digital control. What is PLC? State its industrial applications. **07**
