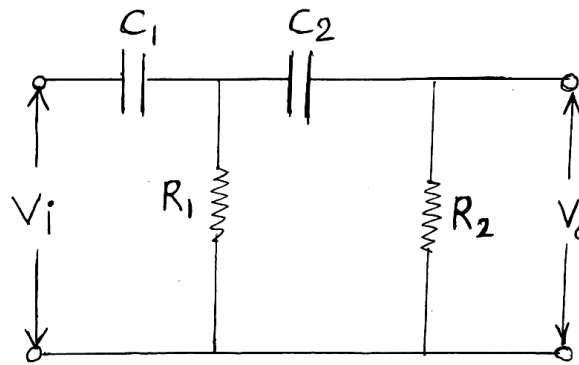


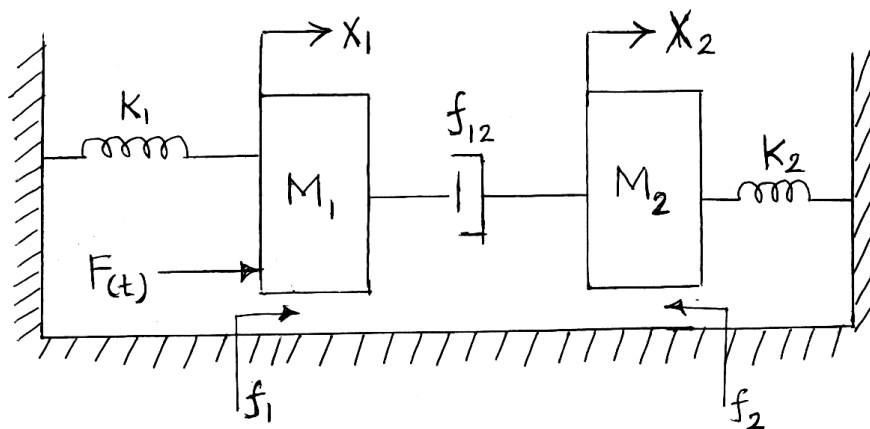
GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV • EXAMINATION – SUMMER • 2014****Subject Code: 141701****Date: 23-06-2014****Subject Name: Control Theory****Time: 10:30 am - 01:00 pm****Total Marks: 70****Instructions:**

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

- Q.1 (a)** Explain open loop and closed loop control system with suitable example & gives its advantages and disadvantages. **07**
- (b)** Find the transfer function of Fig.1 using Mason's gain formula **07**

**Fig : 1**

- Q.2 (a)** Explain the advantages of state space approach over classical methods and obtain state variable equation. $\dot{X} = A X + B U$ and $Y = C X + D U$ Also draw the block diagram. **07**
- (b)** Explain Rules for block diagram reduction technique. **07**
- OR**
- (b)** Write the differential equations for the mechanical system shown in Fig.2. Also obtain an analogous electrical circuit based on force-current analogy. **07**

**Fig : 2**

- Q.3 (a)** By means of Routh criterion, determine the stability of the system described by characteristic equations. **07**
- (1) $S^4 + 2 S^3 + 8 S^2 + 4 S + 3 = 0$
- (2) $3S^4 + 10 S^3 + 5 S^2 + 5 S + 2 = 0$

- (b) Explain following terms with necessary diagrams. 07
 (1) Delay Time (2) Rise Time (3) Peak Time
 (4) Steady state error (5) Settling Time.
- OR**
- Q.3** (a) Explain standard Test signals & derive equation of steady state error. 07
 (b) A certain Feedback control system is described by the following transfer 07
 function.
 $G(s) = K / S^2 (S+20) (S+30)$, $H(s) = 1$
 Determine steady state error coefficients & also determine the value of K to
 limit the steady state error to 10 units due to input $r(t) = 1 + 10t + 20t^2$.
- Q.4** (a) Discuss Nyquist's stability criterion. 07
 (b) What are the Bode plots? With necessary diagrams explain the following terms. 07
 (1) Gain cross over frequency (2) Phase cross over frequency
 (3) Gain Margin (4) Phase Margin.
- OR**
- Q.4** Sketch the Root Locus of unity feedback control system with 14
 $G(s) = K/S(S+1)(S+3)$ and determine the value of K for Marginal stability.
- Q.5** (a) Write a short note on thermal system , its modeling and analysis for two 07
 different inputs.
 (b) Explain Rules for construction of Root Locus. 07
- OR**
- Q.5** (a) What is Transfer function ? Discuss its properties, advantages & disadvantages 07
 of it.
 (b) Find Polar Plots of $G(s) = 1/ (1+P_1S) (1+P_2S)$ 07
