Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. Semester-IV- Examination June- 2011

Subject code: 141701

Subject Name: Control Theory

Date: 10/06/2011 **Time : 10:30 am to 1:00 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)** Obtain state space representation of system shown in Figure-1 **07**

(b) Describe Correlation between transfer function and state-space equations with suitable examples **07**

Q.2 **(a)** From block diagram shown in Figure-2, Draw the corresponding signal flow graph and evaluate closed-loop transfer Function using Mason's gain Formula. **07**

(b) System 1 has transfer Function $G_{1(s)} = 30 / 4S^2+3S+6$ and system 2 has transfer Function $G_{2(s)} = 2 / S+4$ .Find cascade and parallel transfer Function for system 1 and system 2. Write MATLAB program to find cascade, and parallel transfer Function from given transfer Function. **07**

OR

(b) Define Following Terms **07**
(1) Transfer Function (2) State (3) Self Loop (4) Source Node
(5) Rise Time (6) Settling Time (7) Peak Time

Q.3 **(a)** A system has following transfer Function $C_{(s)} / R_{(s)} = 20 / S+10$. Determine its unit impulse ,step and ramp response with zero initial conditions. Sketch the response. **07**

(b) The characteristic equation of Feedback control system is **07**
$S^4+20S^3+15S^2+2S+K=0$.
(1) Determine range of K for system stability.
(1) Can the system be marginally stable ? If so, find the required value of K and Frequency of sustained oscillations.

OR

Q.3 A unity Feedback system has open loop Transfer Function, **14**
$G_{(s)}H_{(s)} = K (S+1) / S(S-1)(S^2+ 4 S+16)$. Obtain its Root Locus.

Q.4 For system having the open loop transfer function $G(s)H(s) = 10 / S(S+1)(S+10)$. Determine the Stability of system by plotting the Bode Plot of the system. **14**

OR

Q.4 **(a)** Describe Liquid Level system and Derive Transfer Function of Liquid Level system with Interaction. **07**

(b) Draw the Nyquist Plot for $G(s)=1/S(S-1)$ and also Write MATLAB program for it. **07**

Q.5 **(a)** What is analogous system? Explain Force-Voltage and Force-Current Analogy With suitable Example **07**

(b) Find Transfer Function of given network in Figure-3. **07**

OR

Q.5 **(a)** Explain Standard Test signals **07**

(b) Explain Root Locus Technique Rules. **07**

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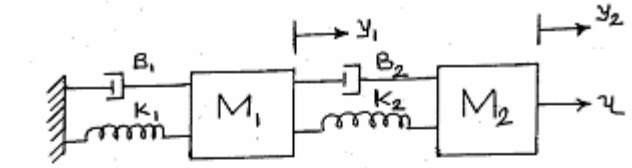

Figure-1, Q-1(A)

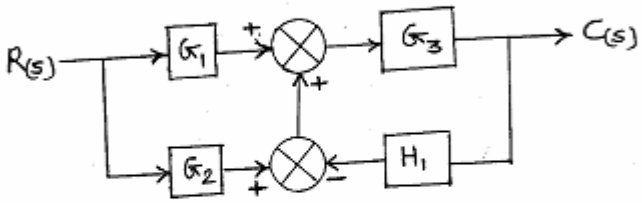

Figure-2, Q-2(A)

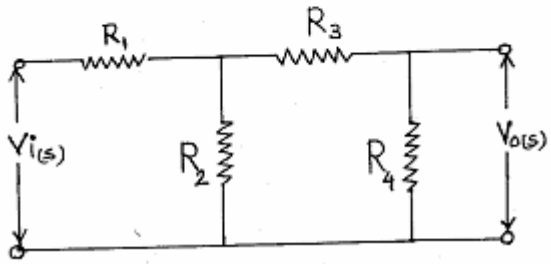

Figure-3, Q-5(B).