TEC- 501

Roll No.

# (SEM. V) (ODD SEM) EXAMINATION, 2019-20
## B.Tech.
## AUTOMATIC CONTROL SYSTEM

**Time: 3 Hours** **Marks: 100**

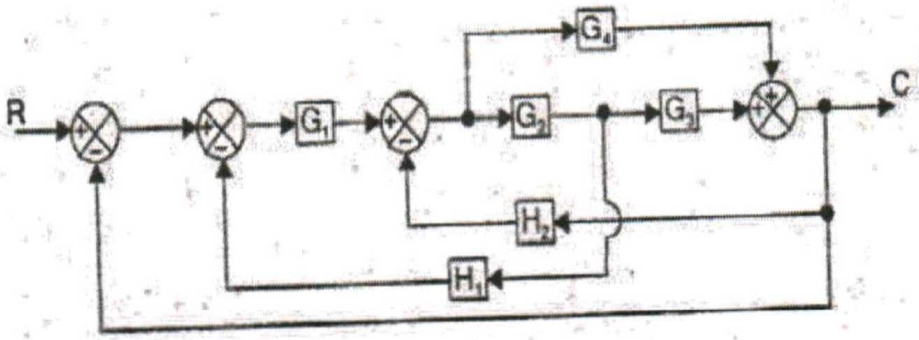
**Total no. of printed pages: 2**

**Note: Attempt all questions. All questions carry equal marks.**

**Q1. Attempt any four parts:** **5x4=20**

**(a)** Explain different block reduction techniques for control system

**( b)** Calculate the Transfer function of the given block diagram.



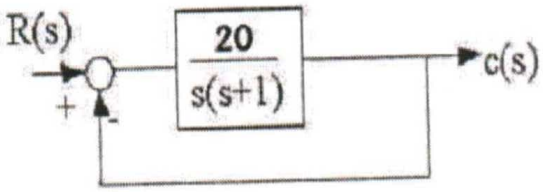

**(c)** Explain the force –voltage analogy in the electrical circuit.

**(d)** Describe the rule of Block Reduction diagram in the control system.

**(e)** Describe the rotational mechanical system with it's transfer function.

**Q2. Attempt any four parts:** **5x4=20**

**(a)** The given block diagram. Find the value of natural frequency, damping frequency, maximum overshoot, rise time, settling time, peak time and steady state error of the system.

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**(b)** Discuss the Time response of a second order control system subjected to a unit step input function and also sketch the time response diagram.

**(c)** Explain proportional integral control and determine the steady state error.

**(d)** Explain Static and Dynamic error coefficient's in the control system.

**(e)** The open loop transfer function of a unity feedback control system is given below: $G(s) = K*(s+2) / (S^3+\lambda s^2+4s+1)$ calculate the value of k and $\lambda$ such that the closed-loop unit step response has natural frequency 3 rad/sec. and damping factor is 0.2.

**10x2=20**

**Q3. Attempt any two parts:**

**(a)** Using Routh-Hurwitz criterion determine the relation between K and T so that unity feedback control system whose open loop transfer function given below is stable

$G(s)=K / s[s(s+10)+T]$

**( b)** Sketch the root locus plot for thr system having open loop transfer function is given by $G(s)\,H(s) = K / [s(s+4)(s^2+4s+13)]$.

**( c)** Construct Bode plot and determine the gain margin , phase margin and stability of the system.

$G(s)H(s) = 4/ [s(1+0.5s)(1+0.08s)]$

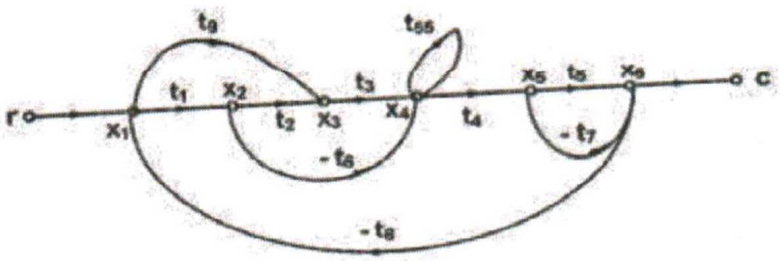
**10x2=20**

**Q4. Attempt any two parts:**

**(a)** Explain phase– lag compensation network and calculate it's transfer function.

**(b)** The open loop transfer function of a uniy feedback control system is given by $G(s) = K / [s(s+2)]$ the system is to have 25% maximum overshoot and peak time 1 sec. Determine the value of K and tachometer feedback constant $K_t$.

**(c)** Find the transfer function of the given signal flow graph .




**10x2=20**

**Q5. Attempt any two parts:**

**(a)** Write down the properties of state transition matrix.

**b)** Discuss the controllability and observability in a control system.

**c)** The transfer function of a control system is given by
[illegible] for controllability and observability.