Sub Code: REE503

Paper Id: 120503 Roll No: | | | | | | | | | | | | | |

B TECH
(SEM V) THEORY EXAMINATION 2018-19
CONTROL SYSTEM

Time: 3 Hours *Total Marks: 70*

Notes:

- *Attempt all Sections. Assume any missing data.*

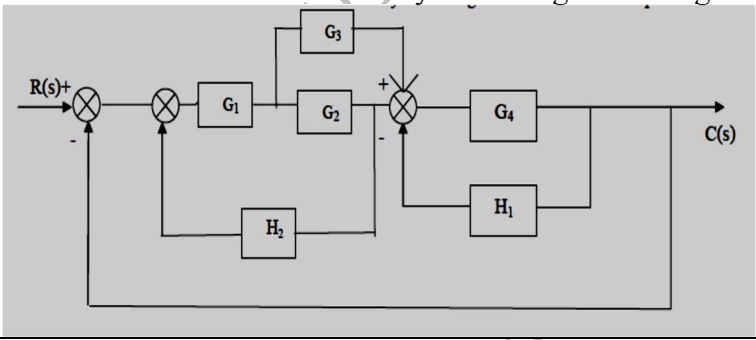
SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

a.	The impulse response of unity feedback control system is $C(t)= te^{-t} +2b\ e^{-t}$, find transfer function.
b.	Give example of type zero, type one and type two susyems.
c.	What is damping constant give its relation with time constant.
d.	What is centroid of asymptotes & how the centroid is calculated?
e.	Sketch polar plot of $G(s)= 1/ (1+\alpha S)$
f.	Explain Gain crossover frequency Margin, Phase crossover frequency.
g.	Enlist the properties of state transition matrix.

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

a.	State and explain Masson's gain formula. For the system shown in the figure find the overall transfer function of system using block diagram reduction. 
b.	The close loop transfer function is given by- $T(s) = k\ (s+z) / s^2+4s+8$, Where k, z is adjustable. i. If r(t) = t finds k & z so that steady state error is zero. ii. for the value of k, z obtain in part i. find e(∞) for input $r(t)= t^2 /2$
j.	Explain stability on basis of location of poles and zeros, For a unity feedback system $G(s) = k / s(s+1)(1+2s)(1+3s)$. Determine range of K for stability, value of k for frequency of sustain oscillation.
k.	Sketch Nyquist plot for $G(s)\ H(s)= 6 / s^2\ (s+2)$ comment on stability.
l.	Explain the term – State, State Space., State Vector, A SISO system has transfer function $G(s) = \frac{Y(s)}{U(s)} = \frac{1}{s^3+7s^2+14s+8}$. Write down the state equation and state diagram.

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SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

(a)	Explain the effect of sensitivity on feedback system, Determine sensitivity of negative close loop system where G(s)= 20/ s(s+4), H(s)=0.5 wrt forward path transfer function, feedback path transfer function
(b)	Derive Block diagram of Armature controlled & field Controlled DC motor with proper labeling of circuit diagram.

4. Attempt any *one* part of the following: 7 x 1 = 7

(a)	Explain steady state error due to step input for type 0,1 & 2 system, Find steady state error for - G(s)= 10(1+4s) / s^2(1+s), H(s)=1, input r(t)=1+ t + t^2/2
(b)	i. Draw the root locus of characteristics equation for second order system as damping ratio varies from -∞ to +∞ keeping W_n constant. ii. Explain the effect of adding poles & zero to transfer function.

5. Attempt any *one* part of the following: 7 x 1 = 7

(a)	A unity feedback system has an Open Loop Transfer Function. Draw the root locus for the system. G(s) H(s)= k (s+2) / (s+3)(s^2+2s+2)
(b)	What is the necessary condition for stability? Explain limitation of Routh's stability method, Construct Routh array and determine the stability of the system whose characteristics equation, $s^5+2s^4+s^3+2s^2+s+4 = 0$.

6. Attempt any *one* part of the following: 7 x 1 = 7

(a)	Draw Bode Plot of unity feedback control system having OLTF $G(s) = \frac{10}{s(1+0.2s)(1+0.2s)}$. Determine GM, PM, gain cross over frequency, phase cross over frequency and discuss stability of closed loop system.
(b)	Explain the strengths of frequency response approach, Establish correlation between frequency domain response and time domain response.

7. Attempt any *one* part of the following: 7 x 1 = 7

(a)	What is lag compensator? What are the characteristics of lag compensation? Explain the frequency response of lag compensator.
(b)	The state equations are given below, Check Controllability & Observability of a system - $\dot{x}_1 = x_2 - x_3 + 3r$ $\dot{x}_2 = x_1 + x_2 + x_3 - 2r$ $\dot{x}_3 = x_1 + x_2 + r$ $y = x_1$