PAPER ID-310311

Subject Code: KEE502

Roll No: | | | | | | | | | | | | | |

B.TECH
(SEM V) THEORY EXAMINATION 2020-21
CONTROL SYSTEMS

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

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

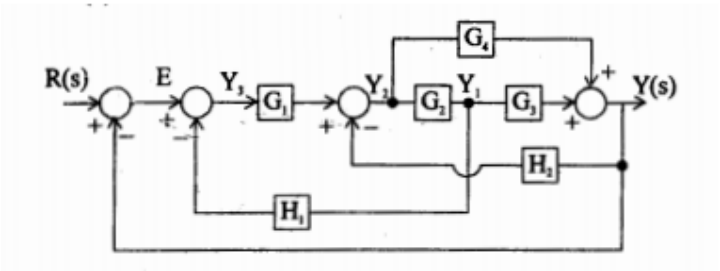
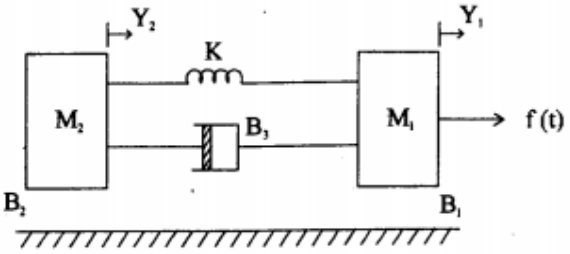
SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

Qno.	Question	Marks	CO
a.	List the advantages of closed loop over open loop system.	2	1
b.	Define transfer function. Give an example for it.	2	1
c.	Write the Manson's gain formula	2	2
d.	What are the standard test signals used in control system	2	2
e.	Distinguish between type and Order of a system	2	3
f.	Define a stable system	2	3
g.	Define gain and phase margins	2	4
h.	Why negative feedback is preferred in closed loop control system.	2	4
i.	Define state and state variable.	2	5
j.	State the necessary condition of stability.	2	5

SECTION B

2. Attempt any *three* of the following:

Qno.	Question	Marks	CO
a.	Determine the transfer function of the given system using block diagram reduction 	10	1
b.	Write down the differential equation governing the mechanical translation system and find the transfer function 	10	1
c.	Define the following term: i) Rise time ii) Peak time iii) Peak Overshoot iv) Settling time	10	2
d.	Find the state transition matrix of the following matrix $A=\begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix}$	10	4
e.	What are the characteristics of servomotors? Compare the AC and Dc servomotors?	10	5

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SECTION C

3. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	Derive the expression for steady state error and explain Kp,Kv and Ka.	10	3
b.	For the unity feedback control system the open loop transfer function, $G(s)=10(s+2)/s^2(s+4)$. Find the e_{ss} when the input is $r(t)=3-2t+3t^2$. And find K_p, K_v and K_a	10	2

4. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	Derive the time response of first order system.	10	2
b.	The open loop transfer function of a unity feedback control system is given by $G(s)=9/s(s+3)$. Find the natural frequency of response, damping ratio, damped frequency and time constant.	10	2

5. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	Determine the Routh's stability of given characteristics equation $S^4+8S^3+18S^2+16S+5=0$	10	3
b.	Draw Nyquist plot for the open loop transfer function is $G(s)H(s)=1/s(s+2)$	10	3

6. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	Sketch the root locus of the system, whose transfer function is $G(s)=K(s+15)/s(s+1)(s+5)$	10	4
b.	Write down the procedure for designing Lag-Lead compensator .	10	4

7. Attempt any *one* part of the following:

Qno.	Question	Marks	CO
a.	Find the controllability and observability of the system $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(t)$ $y(t) = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + 0[u]$	10	5
b.	Obtain the state space representation for the following differential equation $\ddot{y} + 5\dot{y} + 7y = 114$, where 'y' is the output and 'u' is the input.	10	5