PAPER ID-420699

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

BTECH
(SEM VI) THEORY EXAMINATION 2021-22
CONTROL SYSTEM

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

Note: Attempt all Sections. If you require any missing data, then choose suitably.

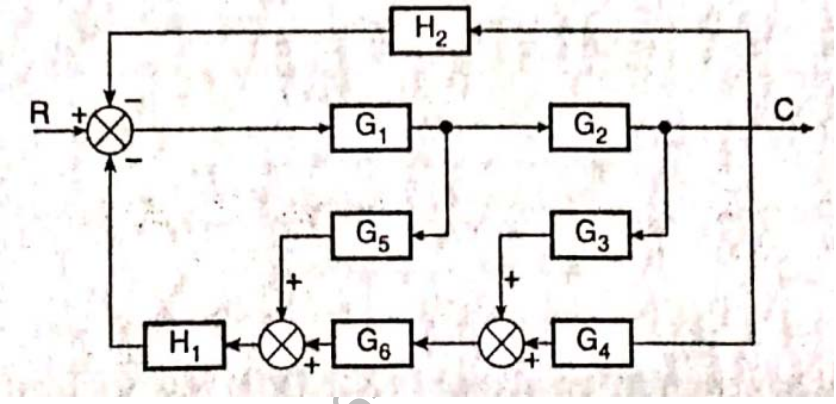
SECTION A

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

Q. No	Questions	CO
(a)	Define Loop and Self Loop with suitable diagram	1
(b)	Draw the Elementary Block Diagram of close loop system.	1
(c)	Enlist the condition for a system to be Observable.	2
(d)	Enlist any two properties of state transition matrix.	2
(e)	Define Settling time and Maximum peak overshoot.	3
(f)	Define Rise time and Peak Time.	3
(g)	Define Centroid.	4
(h)	Describe the Angle of Departure.	4
(i)	Define Gain Cross Over Frequency.	5
(j)	Define the term Gain Margin and Phase Margin.	5

SECTION B

2. Attempt any *three* of the following: 10*3 = 30

Q. No	Questions	CO
(a)	Obtain overall Transfer function for the given block diagram shown in Figure using Block reduction Method: 	1
(b)	Find out the Response for the given systems using parallel decomposition method also sketch its associated state space model. $\frac{Y(S)}{U(S)} = \frac{1}{(s+2)(s+3)(s+4)}$	2
(c)	Consider a unity feedback system with a closed transfer function $\frac{C(s)}{R(s)} = \frac{KS+b}{s^2+as+b}$. Determine open loop transfer function. Show that the steady state error with unit ramp input is given by $\frac{a-K}{b}$.	3

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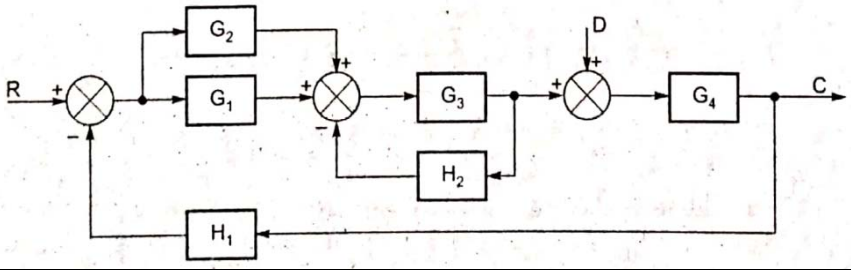
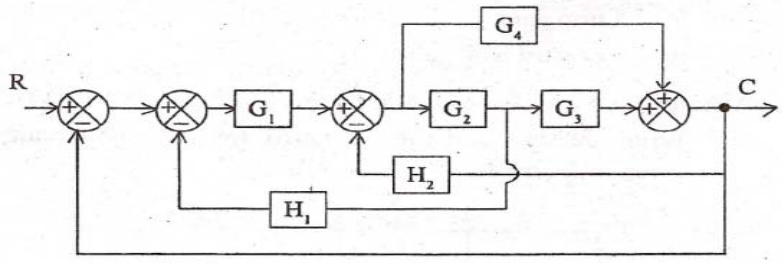
(d)	The characteristic equation of a feedback control system is $S^4+20s^3+15s^2+2s+k=0$ Determine the range of k for the system to be stable.	4
(e)	A single loop feedback control system has open loop transfer function .Sketch the Polar Plot. $$G(s)H(s) = \frac{1}{s(s+3)}$$	5

SECTION C

3. Attempt any *one* part of the following: 10*1 = 10

Q. No	Questions	CO
(a)	Find the C/R and C/D ratio for the given System: 	1
(b)	Using Mason's gain formula, evaluate the overall transfer function: 	1

4. Attempt any *one* part of the following: 10 *1 = 10

Q. No	Questions	CO
(a)	Find out the Response for the given systems using parallel decomposition method also sketch its associated state space model. $$\frac{Y(S)}{U(S)} = \frac{2s^2+8s+7}{(s+1)(s+2)^2}$$	2
(b)	Examine the Controllability and Observability of the following system: $$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \quad B = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} \quad C = [10 \quad 5 \quad 1]$$	2

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5. Attempt any *one* part of the following: 10*1 = 10

Q. No	Questions	CO
(a)	The open loop transfer function of a unity feedback system is given by $$G(S) = \frac{K}{S(1+ST)}$$ Where 'K' & 'T' are positive constants. By what factor should the amplifier gain be reduced so that the peak overshoot of unit step response of the system is reduced from 80% to 20%.	3
(b)	Evaluate the unit step response with proper derivation for a Critically damped 2nd order system.	3

6. Attempt any *one* part of the following: 10*1 = 10

Q. No	Questions	CO
(a)	For a unity feedback system of O.L.T.F is given by $$G(s)H(s) = \frac{1}{S(S+1)(S+3)}$$ a) Sketch the Root locus for $0 \leq K \leq \infty$. b) At what value of K, the system become unstable.	4
(b)	For a unity feedback system of O.L.T.F is given by $$G(S)H(S) = \frac{K}{S(S+6)(S^2+4S+13)}$$ a) Sketch the Root locus for $0 \leq K \leq \infty$. b) At what value of K, the system become stable.	4

7. Attempt any *one* part of the following: 10*1 = 10

Q. No	Questions	CO
(a)	Sketch the Bode Plot for the given system and comment on stability of the used systems: $$G(s)H(s) = \frac{4}{s\,(1+0.5s)(1+0.08s)}$$	5
(b)	Find out the Gain Cross Over Frequency, Phase cross over Frequency, Gain Margin and Phase Margin for the given system: $$G(s)H(s) = \frac{1}{s\,(1+s)(1+2s)}$$	5