PAPER ID-420699

Subject Code: KEC602

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.

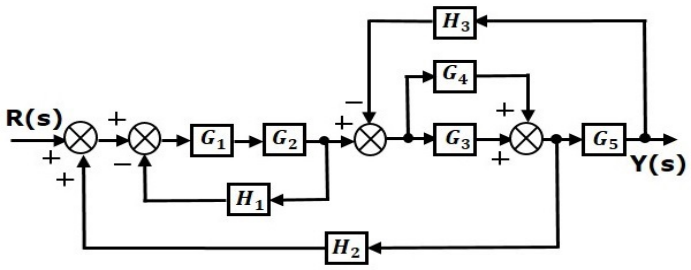
SECTION A

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

Q. No	Questions	CO
(a)	Compare any four differences between close loop and open loop system.	1
(b)	Draw the Elementary Block Diagram of open loop and close loop system.	1
(c)	Enlist the condition for a system to be controllable.	2
(d)	List any two advantages of space state model over transfer function model.	2
(e)	Define Settling time and Maximum peak overshoot.	3
(f)	Define Rise time and Peak Time.	3
(g)	Illustrate how the location of poles of a system related to stability.	4
(h)	Describe the Angle of Departure.	4
(i)	Define Gain Cross Over Frequency.	5
(j)	Enlist the significant of Polar plot.	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)	Construct the state space model for the system described by the differential equation below. The output matrix should be independent of input and be able to measure each state variable. $$\frac{d^3y}{dt^3} + 6\frac{d^2y}{dt^2} + 11\frac{dy}{dt} + 6y = 4u(t)$$	2
(c)	The system shown in fig(a) when subjected to a unit step input, the output response is shown in fig(b). Determine the value of K & T from the response curve.	3

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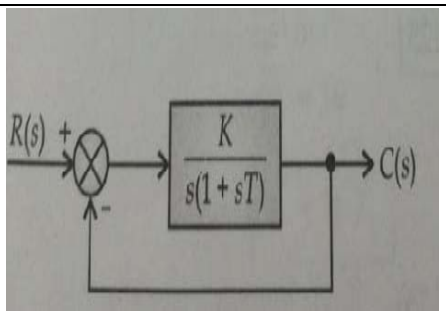
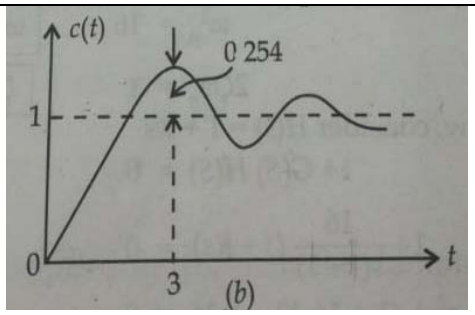
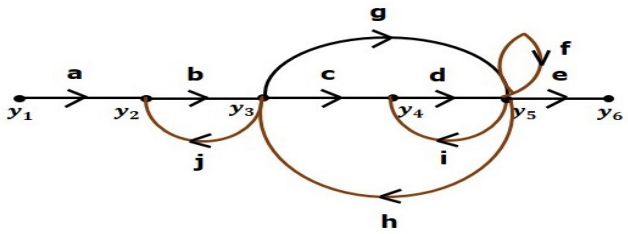
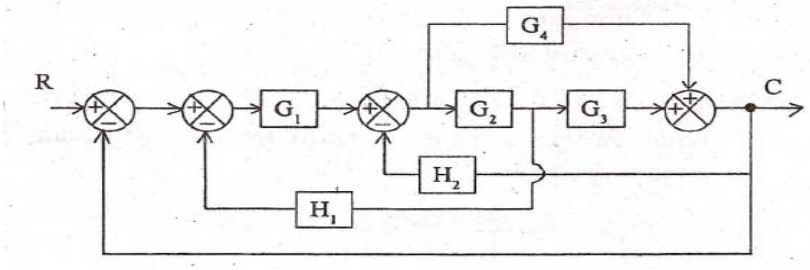
	 fig.(a)  fig.(b)	
(d)	Using Routh Hurwitz Criterion, discuss the stability of the characteristic equation: $$F(s) = 2s^5 + 3s^4 + 2s^3 + s^2 + 2s + 2$$	4
(e)	A single loop feedback control system has open loop transfer function G(s) H(s) = $\frac{1}{s(s+2)(s+10)}$.Sketch the Nyquist plot.	5

SECTION C

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

Q. No	Questions	CO
(a)	For the system shown in Figure, obtain the transfer function by signal flow graph method. 	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)	A single input single-output system has transfer function, enlist the state equations, and draw the state diagram.	2

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	$\frac{Y(s)}{U(s)} = \frac{1}{S^3+7S^2+14S+8}$	
(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

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 75% to 25%.	3
(b)	Evaluate the unit step response with proper derivation for an under 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 $G(S)H(S) = \frac{K}{S(S+1)(S+2)(S+3)}$ 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)	S Sketch the Bode Plot for the given system and comment on stability of the used systems: $G(s)H(s) = \frac{30}{s\,(1+0.5s)(1+0.08s)}$	5