Program: Instrumentation Engineering
Curriculum Scheme: Rev2019 'C' Scheme
Examination: SE Semester IV
Course Code: ISC404 and Course Name: Feedback Control System
Time: 2 hour Max. Marks: 80
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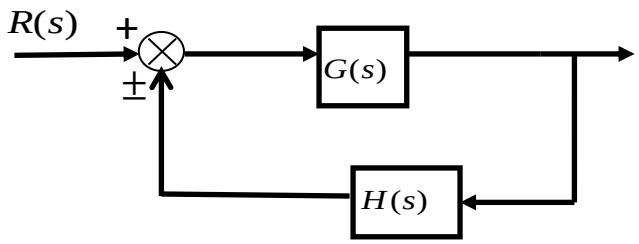
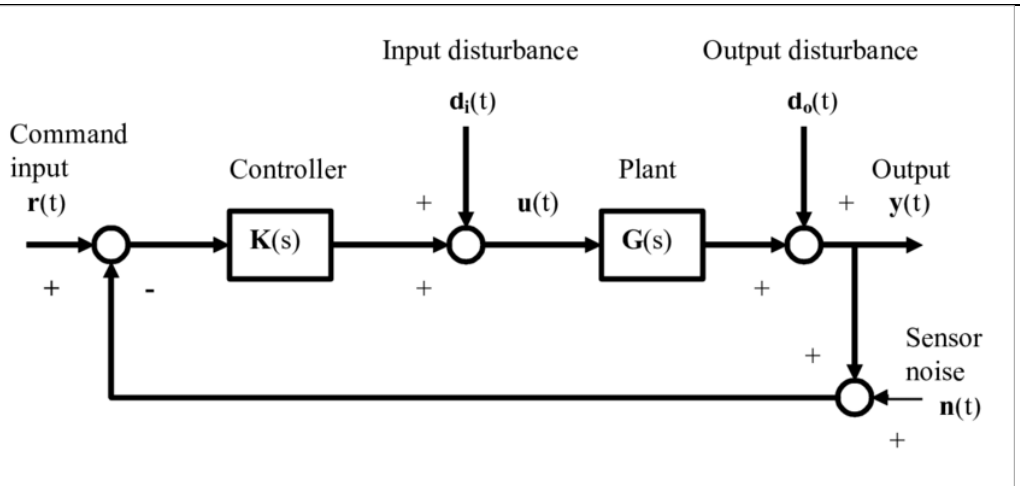
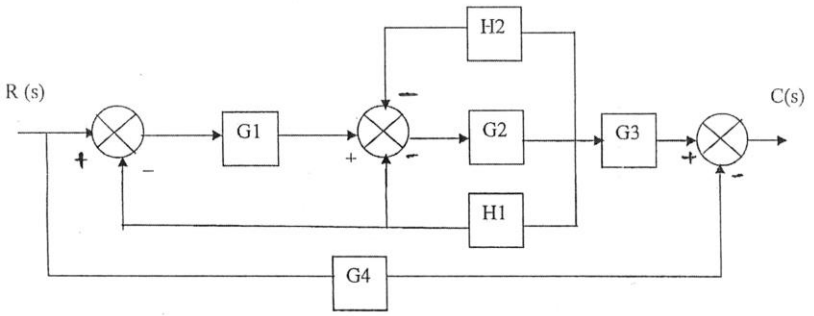
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The principle of homogeneity and superposition is applied to
Option A:	Linear time – variant system
Option B:	Non-linear time- variant system
Option C:	Linear time – invariant system
Option D:	Non-linear time- invariant system
2.	When deriving the transfer function of a linear element
Option A:	Initial conditions are taken into account but the element is assumed to be not loaded
Option B:	Both initial conditions and loading are taken into account
Option C:	Initial conditions are assumed to be zero and the element is assumed to be not loaded
Option D:	Initial conditions are assumed to be zero but loading is taken into account
3.	Signal flow graphs:
Option A:	They apply to linear systems
Option B:	The equation obtained may or may not be in the form of cause or effect
Option C:	Arrows are not important in the graph
Option D:	They cannot be converted back to block diagram
4.	Associative law for summing point is applicable only to those summing points which are _____connected to each other.
Option A:	Directly
Option B:	Indirectly
Option C:	Orthogonally
Option D:	Diagonally
5.	Control systems are normally designed with damping factor
Option A:	$\xi = 0$
Option B:	$\xi = 1$
Option C:	$\xi > 1$
Option D:	$\xi < 1$
6.	The block diagram of a closed loop system is shown below. The transfer function is

	
Option A:	$\frac{C(S)}{R(S)} = \frac{G(S)}{1 \pm G(S)H(S)}$
Option B:	$\frac{C(S)}{R(S)} = \frac{G(S)}{1 \mp G(S)H(S)}$
Option C:	$\frac{C(S)}{R(S)} = \frac{1 \pm G(S)H(S)}{G(S)}$
Option D:	$\frac{C(S)}{R(S)} = \frac{1 \mp G(S)H(S)}{G(S)}$
7.	If two blocks having gains G1 and G2 respectively are in series connection, find the resultant gain using block diagram reduction technique?
Option A:	G1+G2
Option B:	G1*G2
Option C:	G1-G2
Option D:	G1/G2
8.	How many asymptotes will require to draw root loci of a system with open loop transfer function G(s)H(s) = K/s(s+6)(s+9) is
Option A:	One
Option B:	Two
Option C:	Three
Option D:	Four
9.	Laplace transform of unit step signal is :
Option A:	1/s
Option B:	A
Option C:	1
Option D:	A/s
10.	Root locus starts from
Option A:	Open loop poles
Option B:	Open loop zeros
Option C:	Closed loop poles
Option D:	Closed loop zeros
11.	Identify the given system

	
Option A:	open loop control system.
Option B:	open loop uncontrol system.
Option C:	closed loop uncontrol system.
Option D:	closed loop control system.
12.	_____technique gives quick transient and stability response
Option A:	Bode
Option B:	Nyquist
Option C:	Nichols
Option D:	Root locus
13.	At the gain crossover frequency
Option A:	$\lvert G(j\omega)H(j\omega)\rvert = 0$ dB
Option B:	$\lvert G(j\omega)H(j\omega)\rvert = 1$ dB
Option C:	$\lvert G(j\omega)H(j\omega)\rvert = 20$ dB
Option D:	$\lvert G(j\omega)H(j\omega)\rvert = -20$ dB
14.	If the constant *'K'* is positive, then what would be its contribution on the phase plot?
Option A:	45°
Option B:	90°
Option C:	0°
Option D:	180°
15.	The frequency at which the phase curve of a Bode plot crosses -180^0 line is termed as
Option A:	Natural frequency
Option B:	Phase crossover frequency
Option C:	Gain crossover frequency
Option D:	Corner frequency
16.	The output of the feedback control system must be a function of:
Option A:	Reference input
Option B:	Reference output

Option C:	Input and feedback signal
Option D:	Output and feedback signal
17.	Loop which does not possess any common node are said to be _____ loops.
Option A:	Forward gain
Option B:	Touching loops
Option C:	Feedback gain
Option D:	Non touching loops
18.	Consider a system with transfer function G(s) = s+6/Ks²+s+6. Its damping ratio will be 0.5 when the values of k is:
Option A:	6
Option B:	1/6
Option C:	3
Option D:	2/6
19.	Undamped natural frequency of a second order system has the following influence on the response due to various excitations:
Option A:	Decrease in speed of response and increase sensitivity
Option B:	Has no influence in the dynamic response
Option C:	Increase in speed of response and decrease sensitivity
Option D:	Increase oscillatory behavior
20.	The rise time of a second order underdamped system is the time taken by the output to rise
Option A:	From 10% to 90% of its final steady state value
Option B:	From 0% to 100% of its final steady state value
Option C:	From 5% to 95% of its final steady state value
Option D:	From 0% to 50% of its final steady state value

Q2.	**Solve any Two Questions out of Three** **10 marks each**
A	For the following function draw the Root locus and comment on stability $G(s)H(s) = \frac{k}{S(S+3)(S^2+4S+3)}$
B	For the transfer function given below: $G(s)H(s) = \frac{(s+100)}{s(s+205)(s^2+24s+16)}$ Find:- i. Static position error constant ii. Static velocity error constant iii. Static acceleration error constant Steady state error if the input to the system is unit step.
C	Sketch the Signal Flow Graph of following block diagram. By using Mason's Gain formula find the transfer function of it.

Q3.	**Solve any Two Questions out of Three** **10 marks each**
A	Sketch the polar plot of the transfer function given below. G(s)=1/(1-S)(1-2S)
B	The characteristic equation for a certain feedback control system are given below. Determine the range of k for the system to be stable. 1. $S^3 + 2kS^2 + (2 + k)S + 4 = 0$ 2. $S^4 + 20kS^3 + 5S^2 + 10S + 15 = 0$
C	Design and construct the Bode plot for the system whose open loop transfer function is given by G(s) = 100 / s(s+0.5)(s+10). Determine the Gain margin and Phase margin and comment on stability.