University of Mumbai

Examinations Commencing from May 2022

Program: **Bachelor of Engineering**

Curriculum Scheme: **Electronics & Telecommunication (Rev2019 "C")**

Examination: **SE Semester III**

Course Code: **ECC305** and Course Name: **Electronic Instrumentation & Control Systems**

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Calibration of instrument is an important consideration in measurement system The errors due to instruments being out of calibration can be rectified by_____.
Option A:	Increasing the frequency of recalibration
Option B:	Increasing the temperature coefficient
Option C:	Increasing the susceptibility of measuring instrument
Option D:	Decreasing the frequency of recalibration
2.	AC bridges are used for the measurement of_____.
Option A:	Resistances
Option B:	Inductances and capacitances
Option C:	Resistances and Inductances
Option D:	Resistances, inductances and capacitances
3.	In NTC as temperature increases, resistance_____.
Option A:	Increases
Option B:	Remains constant
Option C:	Decreases
Option D:	Behaves abruptly
4.	Transfer function of the system is defined as the ratio of Laplace output to Laplace input considering initial conditions_____.
Option A:	1
Option B:	2
Option C:	0
Option D:	Infinite
5.	In regenerating the feedback, the transfer function is given by
Option A:	C(s)/R(s)=G(s)H(s)/1+G(s)H(s)
Option B:	C(s)/R(s)=G(s)H(s)/1-G(s)H(s)
Option C:	C(s)/R(s)=G(s)/1+G(s)H(s)
Option D:	C(s)/R(s)=G(s)/1-G(s)H(s)
6.	The characteristic equation of a system is given s4+10s3+5s2+2=0. This system is
Option A:	Stable
Option B:	Marginally stable
Option C:	Unstable
Option D:	Linear
7.	Consider the loop transfer function K(s+6)/(s+3)(s+5) In the root locus diagram the centroid will be located at:
Option A:	-4
Option B:	-1
Option C:	-2
Option D:	-3

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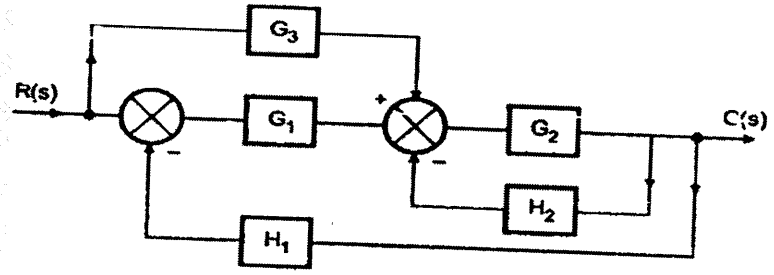
8.	The damping ratio and peak overshoot are measures of:
Option A:	Absolute stability
Option B:	Relative stability
Option C:	Speed of response
Option D:	Steady state error
9.	In a bode magnitude plot, which one of the following slopes would be exhibited at high frequencies by a 4th order all-pole system?
Option A:	-80dB/decade
Option B:	-40 dB/decade
Option C:	40 dB/decade
Option D:	80 dB/decade
10.	For Nyquist contour, the size of radius is
Option A:	25
Option B:	0
Option C:	1
Option D:	∞

Q2 (20 Marks Each)	**Solve any Four out of Six** **5 marks each**
A	Discuss static and dynamic characteristics of instruments.
B	Draw and discuss Maxwell bridge and its application for measurement of inductance.
C	What is Impulse response of a system? If Impuise response of a certain system is e-5t. Find out transfer function of this system.
D	Define rise time, peak time, maximum overshoot, Delay time, Settling time
E	Use the Rouths stability criterion to determine the range of K for a unity feedback system whose open loop transfer function is $G(s)=\frac{K}{s(s+1)(s+2)}$
F	Define resonant frequency, cut-off rate and bandwidth of a system.

Q3 (20 Marks Each)	**Solve any Two Questions out of Three** **10 marks each**
A	Explain with neat diagram principle, construction and working of LVDT. Define its application in displacement measurement.
B	Determine the overall transfer function C(S)/R(S) for the system shown below using block diagram reduction method. 
C	A unity feedback system has $G(s)=\frac{40(s+2)}{s(s+1)(s+4)}$ Determine a) Type of system

	b) error coefficients c) Error for ramp input with magnitude 4

Q4. **(20 Marks Each)**	
A	**Solve any Two** **5 marks each**
i.	Compare the temperature transducers RTD, thermistors and thermocouples on the basis of principle, characteristics, ranges and its applications.
ii.	Define rise time, peak time, maximum overshoot, Delay time, Settling time
iii.	What are the three types of compensators? Explain uses of all three compensators.
B	**Solve any One** **10 marks each**
i.	Plot the root locus for a unity feedback control system has an open loop transfer 
ii.	Sketch the Bode plot for the unity feedback control system  Determine the gain and phase margin

B	**Solve any One**	**10 marks each**
i.	Sketch the root locus for a given system $G(s)H(s) = \frac{K}{s(s+5)(s+10)}$	
ii.	Sketch the Bode plot for the unity feedback control system with forward gain as $G(s) = \frac{200}{s(s+2)(s+20)}$ Determine the gain and phase margin and also comment on stability.	