University of Mumbai

Program: **Mechanical Engineering**

Curriculum Scheme: R-16

Examination: TE Semester V

Course Code: MEC502 Course Name: Mechanical Measurement and Control

Time: 2 hour Max. Marks: 80

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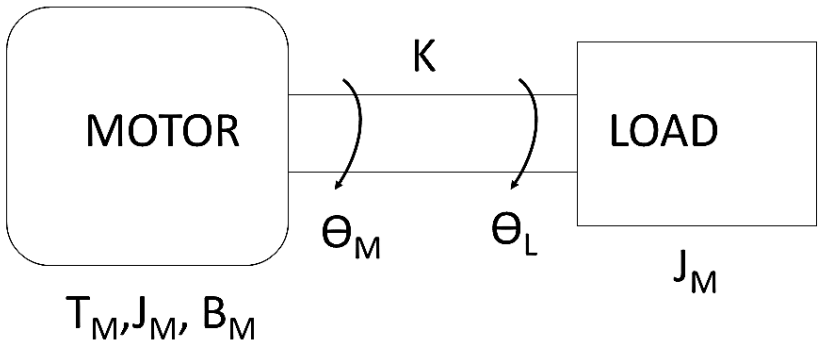
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks. 2 Marks each**
1.	The step input is
Option A:	Input is a function of time
Option B:	input remains constant with time,
Option C:	input is parabolic with time
Option D:	input is sinusoidal
2.	The Steady state error is the difference between
Option A:	desired out put with actual output
Option B:	actual output and desired output
Option C:	controlled output and desired output
Option D:	Controlled output with error input
3.	The order of a system is represented by
Option A:	Highest power of ‘S’ in numerator of transfer function,
Option B:	Lowest power of ‘S’ in numerator of transfer function
Option C:	Highest power of ‘S’ in denominator of transfer function
Option D:	Highest power of ‘S’ of the characteristic equation of transfer function
4.	A critically damped system is one whose roots of characteristic equation are
Option A:	repeated and imaginary,
Option B:	none repeated and imaginary,
Option C:	real and negative,
Option D:	real and positive
5.	The system is said to be stable using Routh’s criteria, if
Option A:	Complete Routh’s array shows same sign
Option B:	only first column of Routh’s array shows same sign,
Option C:	only second column of Routh’s array shows same sign,
Option D:	Row of zeros appears
6.	Damping factor is
Option A:	Resistance to the oscillations of control system,
Option B:	factor determining steady response to vanish ,
Option C:	factor determine system friction
Option D:	Controlled output
7.	Settling time is the time of
Option A:	Time of highest peak of oscillating response,

Option B:	Maximum time to vanish transient response,
Option C:	time required to reach 90% of output in first interval
Option D:	Rise time of the actual output
8.	The automatic traffic signal system is
Option A:	An open loop control system
Option B:	an semi-open loop control system,
Option C:	an close loop control system
Option D:	Feed forward control system
9.	The effect of shift of take away point behind the block
Option A:	Output remains unchanged with shifting,
Option B:	output is changed with shifting,
Option C:	feedback remains unchanged with shift,
Option D:	feedback changed with shift
10.	The analogous electrical component for angular displacement in mechanical system in F-I analogy
Option A:	charge
Option B:	flux,
Option C:	resistance
Option D:	capacitance
11.	A transducer converts
Option A:	Mechanical energy into electrical energy
Option B:	Mechanical displacement into electrical signal
Option C:	One form of energy into another form of energy
Option D:	Electrical energy into mechanical form
12.	One of the following can act as an inverse transducer
Option A:	Electrical resistance potentiometer
Option B:	L V D T
Option C:	Capacitance transducer
Option D:	Piezo electric crystals
13.	In thermal conductivity gauges, the major source of errors is heat lost on account of
Option A:	radiation
Option B:	conduction
Option C:	convection
Option D:	both conduction and convection
14.	Bridgman gauges use
Option A:	Monel and Stainless Steel
Option B:	Manganin and Gold Chrome
Option C:	Phosphor Bronze
Option D:	Beryllium Copper
15.	The limitations on use of strain gauges at high temperatures is due to
Option A:	deterioration of grid material
Option B:	use of weldable type gauges
Option C:	decomposition of cement and carrier materials

Option D:	use of flame spraying
16.	In wire wound strain gauges, the change in resistance on application of strain is mainly due to
Option A:	change in length of wire
Option B:	change in diameter of wire
Option C:	change in both length and diameter of wire
Option D:	change in resistivity
17.	Which of the following meter is used for measuring flow of clean fluids only?
Option A:	Ultrasonic flow meter
Option B:	Turbine flow meter
Option C:	Laser Doppler Anemometer,
Option D:	Hot wire Anemometer
18.	Radiation pyrometers are used in the temperature range of
Option A:	0-500°C
Option B:	500-1000°C
Option C:	-250 to 500°C
Option D:	1200- 2500°C
19.	In a generalized measurement system, the function of the signal manipulating element is to
Option A:	change the quantity under measurement to an analogous signal
Option B:	change the magnitude of the input signal while retaining its identity
Option C:	to perform linear operations like addition and multiplication
Option D:	to perform non-linear operations like filtering, chopping and clipping and clamping,
20.	A set of readings has a wide range and therefore it has
Option A:	low precision
Option B:	high precision
Option C:	low accuracy
Option D:	high accuracy

Q2	**Solve any Four out of Six. 5 marks each**
A	With neat sketch explain the working of LVDT
B	With neat sketch explain the constructional features and working of piezoelectric anemometer
C	Explain generalized measurement system elements with block diagram and describe it function with suitable example.
D	With neat sect discuss the significance of the following aspects of signal conditioning for any one of the sensor: amplification, conversion filtering
E	What are desired, interfering and modifying inputs with respect to measurement of a system
F	Define and Explain the following: i) Accuracy and Precision, ii) Hysteresis and Linearity

Q3.	**Solve any Two Questions.** **10 marks each**
A	For a unity feedback system having open loop transfer function $G(s) = \frac{14(S+3)}{S(5+S)(S^2+2S+2)}$, Determine a. Type and order of the system b. All error coefficients c. Steady state error for input $1+4t+(t^2/2)$.
B	A motor delivered TM torque and drive a load as shown in fig below. Find equation of system 
C	For a particular unity feedback system $G(s) = \frac{242(S+5)}{S(S+1)(S^2+5S+121))}$ Sketch the Bode Plot, Find ω_{gc}, ω_{pc}, GM and PM. Comment on stability