E-254

B. E. VIII Semester (Main & Re-Exam) Examination – May, 2016

MEASUREMENT AND CONTROLS

Branch : Mechanical Engg.

[Maximum Marks : 75
Min. Marks : 30

Time : Three Hours]

Note : Attempt *all* the questions of Section-A, *four* from Section-B and *three* questions from Section-C.

SECTION – A

(Objective Type Questions)

Note : Attempt *all* questions.

$1.5 \times 10 = 15$

1. The measurement refers to :

    (a) Primary signal   (b) Measured signal

    (c) Output   (d) Process variable

2. Which of the following errors are generally distributed in accordance with the Gaussian distribution ?

    (a) controllable errors   (b) calibration errors

    (c) avoidable errors   (d) random errors

3. The maximum amount by which the result differs from the true value is called :

    (a) correction   (b) discrepancy

    (c) error   (d) accuracy

P.T.O.

4. Elements of the indicating device carrying the scale is called :

   (a) dial
   (b) housing

   (c) transducer
   (d) index

5. Surface plate is usually mode of grey cast iron because it provides :

   (a) non wearing plate
   (b) very hard plate

   (c) easy to cast plate
   (d) lubrication due to graphite flakes

6. Electronic level contains :

   (a) a pendulum
   (b) Spirit level

   (c) Micrometer
   (d) sine bar

7. Flow in open channels is measured by using :

   (a) nozzle
   (b) orifice plate

   (c) propeller
   (d) weir

8. Point out the device that refers to a self-generating transducer :

   (a) resistive
   (b) photo voltaic

   (c) piezo-electric
   (d) inductive

9. Which one of the following constitutes the most important specification of an instrument ?

   (a) resolution
   (b) reproducibility

   (c) range
   (d) sensitivity

(2)

10. Identify the visual display unit :

    (a)   cathode ray oscilloscope   (b)   Storage oscilloscope

    (c)   Moving coil oscilloscope   (d)   u-v-recorder

SECTION – B

Note : Attempt any *four* questions : $6 \times 4 = 24$

1. What do you understand by the term "Measurement" ? Also explain direct and indirect method of measurements.

2. Explain briefly the term similarity, accuracy and error.

3. Explain with neat sketch laser Doppler velocimeter.

4. What do you understand by modeling of mechanical system elements ?

5. Explain signal flow graph, with suitable example.

6. For a system with $GH(s) = \dfrac{K}{S(S+2)(S+3)}$ draw root loci and discuss the result.

SECTION – C

Note : Attempt any *three* questions : $12 \times 3 = 36$

1. Draw a block diagram representation of generalized measurement system. Identify the various elements and point out the function performed by each element/component.

2. Explain the following terms :

    (a)   Static error   (b)   Static correction

    (c)   Relative error   (d)   Percentage relative error

    (e)   Dynamic error   (f)   Gross error

(3)   P.T.O.

3. Explain with neat diagram the construction and working of a Cathode Ray Oscilloscope (CRO). Also give the application of a CRO ?

4. (a) Explain briefly Routh's criterion.

   (b) For a system with the characteristic equation :

   $S^3 - 4S^2 + S + 6 = 0$, find the number of roots, if any, with positive real parts.

5. For the first order system shown in fig. derive the solution for output $\theta_0(t)$ as a function of time for a unit step input $\theta_i(t) = 1$, using both time domain and Laplace transform analysis .

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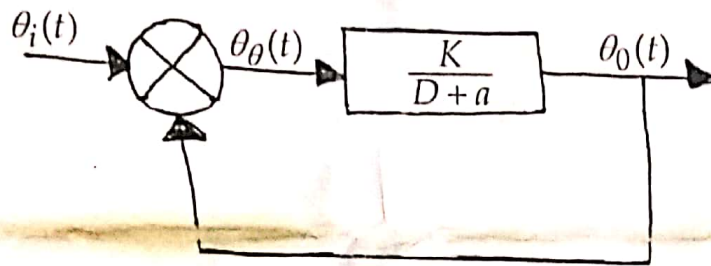
E-465

B.E. VIII Semester Examination, May 2017
(Main & Re-Exam)
Measurement and Controls
(ME)

Time : Three Hours]   *[Maximum Marks : 75*
                                                      [Minimum Marks : 30

Note : Attempt **all** the questions of **Section-A**, four from **Section-B** and **three** questions from **Section-C.**

Section-A
(Objective Type Questions)

Note : This section will contains **ten** objectives type questions. They may be fill in the blanks. True/False or Multiple Choice Type.   1.5×10=15

1. The Zero-Suppression in recorders implies :
   (a) Recording signals with reference to a point other than the zero
   (b) Removing the static component so that rest of the signal is displayed with more expansion.
   (c) Providing intertialess components so that improve transient response.
   (d) Designing the recorder for zero error.

2. In an analog data acquisition unit, the sequences of the blocks starting from the input will be:
   (a) Transducer, recorder, signal, conditioner.
   (b) Transducer, signal, conditioner, recorder.
   (c) Signal, conditioner, transducer, recorder.
   (d) Signal, conditioner, recorder, transducer.

3. The primary sensory element which does not convert velocity to pressure is:
   (a) Venturi tube   (b) Orifice plate
   (c) Pitot tube   (d) Vanes

                                                                    P.T.O.

4. If a restriction is placed in a pipe.

   (a) A flow through the restriction will be increase.

   (b) The pressure at the centre of the restriction will be reduced.

   (c) The flow through the restriction will be main unchanged.

   (d) both (a) and (b)

5. Strain guage, LVDT and thermo-couple may be classified as.

   (a) Active transducers

   (b) Analog transducers

   (c) Primary transducer

   (d) None of the above

6. The resistance of a thermistor is 500Ω and its resistance temparature with a co-efficient is $0.04\Omega/^{0}C$.

   (a) $0.05^{0}C$

   (b) $0.1^{0}C$

   (c) $0.04^{0}C$

   (d) $0.8^{0}C$

7. A synchro is used to.

   (a) Accelerate a rotating shaft.

   (b) Convert an augular position of a shaft into an electrical signals.

   (c) Convert linear motion into angular position.

   (d) Amplify low frequency signals.

8. Piero-electric crystals produce an emf.

   (a) When external mechanical force is applied to.

   (b) When external magnetic field is applied.

   (c) When radient energy stimulates the crystal.

   (d) When the junction of two such crystal is neated.

9. Which of the following does not require auxillary circuitary if used as transducer?

   (a) Capacitance

   (b) Photocell

   (c) Resistance

   (d) Inductance

10. Which of following transducers is used for transmitting as well as receiving the acoustic energy in an ultrasonic flow meter?

    (a) LVDT

    (b) RTD

    (c) Pieroclectric crystals

    (d) Strain gauge

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(2)

Section-B

(Short Answer Type Questions)

Note : This section will contains **six** questions. Student will ask to attempt any **four** questions out of **six** questions. $6 \times 4 = 24$

1. Describe the method of absolute determination of ampere using Rayleigh's current balance. What are the precautions taken to minimize error in measurement?

2. A set of Independent 10 measurement were made to determine the weight of a lead shot. The weighs in gramme were:

   1.570, 1.597, 1.562, 1.580, 1.564, 1.586, 1.550, 1.575

   Determine the :

   (i) Arithmatic mean

   (ii) Average deviation

   (iii) Standard deviation

   (iv) Variance

   (v) Probable error on one reading

   (vi) Probable error of the mean

3. An ac voltmeter with a maximum scale reading of 50V has an inductance of 0.09H and a total resistance of 500 Ω. The magnitising coil is wound with 50 Ω of coper wire and the reminder of the circuits consist of a non-inductive resistance in series with it. Find the value of the capacitance, that should be placed vacross the non-inductive series resistance, to make the instrument road correctly both on dc as well as on ac (of 50Hz) circuits.

4. Write short notes on the following:

   (i) 3-ammeter and 3-voltmeter method of power measurment

   (ii) Two wattmeter method of poner measunement

5. Write short notes:

   (i) Bode plot

   (ii) Nichols plot

6. Discuss the different conditions for time response of first order closed loap system for unit step input.

Section-C

(Long Answer Type Questions)

1. Using diamensional analysis check whether the follow expression is correct or Not

$$R = \frac{1 + W^2C^2R^2}{W^2CR}$$

2. A potential transformer with ratio 1000/100 V, has th llowing constants: Primary resistance 94.5 Ω, Secondary resistence 0.86 mary ractance 66.2Ω, Potal equivent ractance 100 Ω, Magnetic Cureent 0.0 at 0.4 Pf. Calculated,
   (i) The phase angle error at no load between prima & secondary voltages.
   (ii) The load in VA unity Pf at which the Phase angle be zero.

3. Construct Routh array and determine the stability of system whose charac-teristics equation is $S^6+2S^5+8S^5+12S^3+20S^2+16S+$ $= 0$ Also determine the number of roots lying on right h of S-plane, left half of s-plane and on imaginary axis.

4. The open loop transfer function of a unity feedback rol system is given by

   $$G(S) = \frac{K}{(S+2)(S+4)(S^2+65+25)}$$

   By applying the routh criterion, discuss the stability o e closed loop system as a function of K. determine the value of K which will se sustained oscillations in the closed loop system. What are the correspondi scillating frequencies?

5. Determine the stability of closed loop system, whos open loop transfer function in,

   $$G(S)H(S) \frac{(S+2)}{(S+1)(S-1)},$$

   use nyquist stability criterion. Comment on the stat of open loop and closed loop system.

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B. E. VIII Semester (Main & Re-Exam) Examination, May – 2018

MEASUREMENT AND CONTROL

Branch : ME

Time : Three Hours]

[Maximum Marks : 75
[Minimum Marks : 30

Note : Attempt *all* questions from Section-A, *four* questions from Section-B and *three* questions from Section-C.
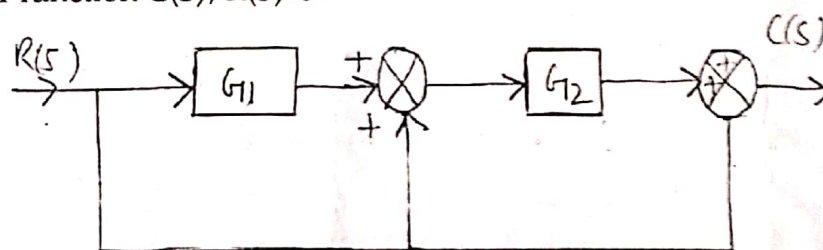
SECTION – A

(Objective Type Questions)

1.5 × 10 = 15

1. In an open loop control system :

   (a) Output is independent of control input

   (b) Output is dependent on control input

   (c) Only system parameters have effect on the control output

   (d) None of the above

2. In closed loop control system, with positive value of feedback gain the overall gain of the system will :

   (a) decrease   (b) increase

   (c) be unaffected   (d) any of the above

3. Which of the following is an open loop control system ?

   (a) Field controlled D. C. motor   (b) Ward leonard control

   (c) Metadyne   (d) Stroboscope

P. T. O.

4. A good control system has all the following features except :

   (a) good stability   (b) slow response

   (c) good accuracy   (d) sufficient power handling capacity

5. The initial response when the output is not equal to input called :

   (a) Transient response   (b) Error response

   (c) Dynamic response   (d) Either of the above

6. Mechanical impedance is the ratio of :

   (a) rms force to rms velocity   (b) rms force to rms displacement

   (c) rms velocity to rms displacement   (d) None of the above

7. Bellows converts :

   (a) pressure difference into displacement

   (b) pressure difference into voltage

   (c) displacement into pressure

   (d) either (a) or (c)

8. LVDT is a :

   (a) pressure transducer   (b) displacement transducer

   (c) velocity transducer   (d) acceleration transducer

9. In a minimum phase system :

   (a) all poles lie in the left half plane   (b) all zeros lie in the left half plane

   (c) all poles lie in the right half plane   (d) None of the above

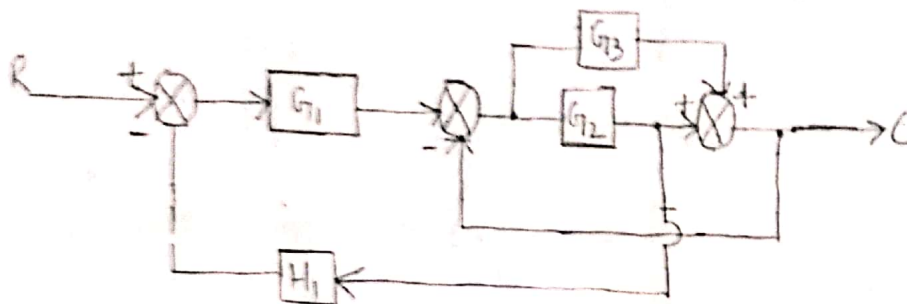10. The transfer function $C(S)/R(S)$ is :

   (a) $G_1 + G_2 + 1$ (b) $G_1G_2 + G_2 + 1$

   (c) $G_1G_2 + 1$ (d) $G_1G_2 + G_1 + 1$

(2)

SECTION – B

6 × 4 = 24

(Short Answer Type Questions)

1. Define errors and its types.

2. Write short notes on :

   (a) Nyquist plot

   (b) Root locus technique

3. Determine the transfer functions C/R from the block diagram shown below :

4. Write short notes on :

   (a) Optical technique for field measurement

   (b) Transfer function

5. State Mason's Gain formula and represent the block diagram by signal flow graph :
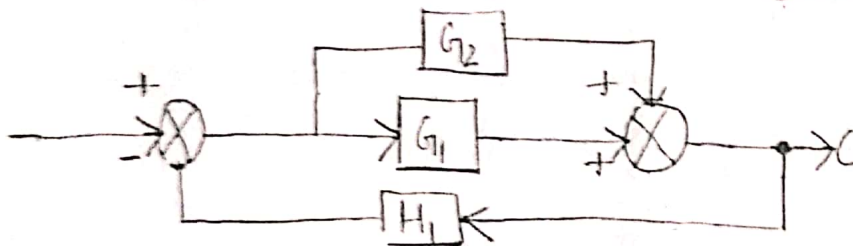
6. Obtain a mathematical model for the mechanical system :

(3)

P. T. O.
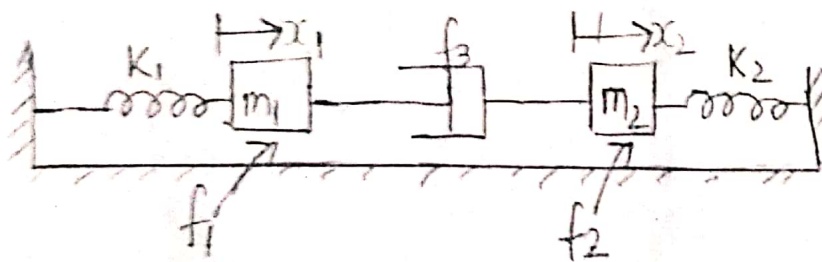
12 × 3 = 36

(Long Answer Type Questions)

1. Write short notes on :

(a) Hot wire anemometer

(b) Pilot tube

2. Determine the stability of closed loop system, whose open loop transfer function is, use nyquist stability criteria ?

$$G(S)H(S) = \frac{S+2}{(S+1)(S+3)}$$

3. Draw root locus plot for each of the following open loop transfer functions :

$$G(S)H(S) = \frac{K}{S(S+6)(S^2+4S+13)}$$

determine :

(a) The breakaway point

(b) The stability condition

(c) Angle of departure from complex poles

4. Determine the stability of a closed loop control system whose characteristic equation is :

$$S^5 + S^4 + 2S^3 + 2S^2 + 11S + 10 = 0$$

5. Define mechatronics and explain its mechanical elements.

_____

(4)