

B.Tech Fifth Semester End Term Examination- 2018

Industrial Instrumentation
UEI05B13

Full Marks: 100

Time: 3 Hours

The figures in the margin indicate full marks for the questions

(Answer question no.1 and any six from the following)

1. Choose the correct answer.

10x1=10

A) Piezo-electric crystals are used for measurement of

i) static changes, ii) dynamic changes, iii) static and dynamic changes, iv) none

B) A resistance thermometer is basically is a/an

i) active transducer, ii) passive transducer, iii) potentiometer type transducer, iv) all of the above

C) The size of air-cored transducers in comparison to their iron cored counter parts is

i) smaller, ii) bigger, iii) same, iv) unpredictable

D) High value pot resistance leads to

i) low sensitivity, ii) high sensitivity, iii) low nonlinearity, iv) less error.

E) Self generating transducers are

i) active transducer, ii) passive transducer, iii) secondary, iv) all of the above

F) The strain gauge should have low

i) gauge factor, ii) resistance, iii) resistance temperature coefficient, iv) all of the above

G) The accelerometer using LVDT has the advantage of

i) high natural frequency, ii) being contactless device, iii) better resolution, iv) all of the above

H) piezoelectric transducers are

i) active transducer, ii) passive transducer, iii) inverse type, iv) all of the above

I) An LVDT has an output in the form of

i) linear displacement of core, ii) pulse, iii) rotary movement of core, iv) none

J) The transducers that converts measured into the form of pulse, is called

i) active transducer, ii) analog transducer, iii) digital transducer, iv) pulse transducer

2. A) List out some major design considerations of bourdon tube.

B) What are the different types of Manometers? Discuss U-tube Manometer in brief. 7+8=15

3. A) How piezoelectric transducer may be used for pressure measurement? Discuss with proper signal conditioning circuit.

B) List out the factors affecting accuracy of any measurement.

B.TECH FIFTH SEMESTER, END TERM EXAMINATION 2018
COMMUNICATION THEORY
UEI05B14

Full Marks: 100

Time: 3 Hrs

The figure in the margin indicate full marks for the questions

1. a) What is communication? (2)
 b) A single tone modulating signal $e_m = E_m \cos w_m t$ modulates a carrier $e_c = E_c \cos w_c t$. Derive the expression for the AM wave. Define the depth of modulation. Discuss the significance of modulation index with suitable diagrams. (2+2+4)
2. a) Differentiate between the passband and baseband signal. (2)
 b) The antenna current of an AM transmitter is 8A when only the carrier is sent but it increases to 8.93 A when the carrier is sinusoidally modulated. Find the percentage modulation. (3)
 c) A 40 KW carrier is to be modulated to a level of 70 %.
 i) What is the carrier power after modulation?
 ii) How much audio power is required if the efficiency of the modulated radio frequency amplifier is 72%? (2+3)
3. a) Define the term modulation and transmission efficiency. (2+2)
 b) What is the maximum transmission efficiency of AM? (1)
 c) What is the transmission efficiency for a DSB-SC and a SSB-SC system. (2)
 d) Discuss the advantages of VSB over SSBSC scheme. (3)
4. Discuss the demodulation of AM wave using both linear and non-linear circuit. (5+5)=10
5. (a) A Differentiator circuit behaves like an FM slope detector-Explain. Compare between AM and FM.
 (b) Explain a Balanced discriminator circuit. (5+5)=10
6. Calculate the fraction of the total power carried by the sidebands in amplitude modulation when the modulation index (m) is 0%, 30%, 50%, 80% and 100% respectively. (10)

7. A modulating signal $\cos 15\pi \times 10^3 t$, FM modulates a carrier of 10 MHz and produces a frequency deviation of 75 kHz.

(i) Find the modulation index and the phase deviation.

(ii) If another modulating signal produces a modulation index of 100 while maintaining the same deviation, find the frequency and amplitude of the modulating signal. Assume $k_f = 15$ kHz/v
(5+5)

8(a) "Pulse modulation systems are not digital: whereas Pulse Code Modulation is" - Justify (5)

(b) Draw and explain the PAM modulator and demodulator circuit. (5)

9. Write short notes on any two:

(2×5=10)

(i) Adaptive Delta Modulation

(ii) PCM system

(iii) Generation of PTM signals.

10.(a) Draw and explain the PWM and PPM modulator and demodulator circuits

(b) Explain the difference between cross-talk and intersymbol interference. Explain the different types of line-coding types along with the properties. (5+2+3)

B. Tech 5th Semester End Term Examination, 2018
Linear Control System
UEI05B11

Full Marks: 100

Time: 3.00 hours

The figures in the margin indicate full marks for the questions
 Candidates are required to give their answers in their own words as far as practicable

Answer any five questions from the following. Each question carries 15 marks.

- ① (i) Sketch the asymptotic Bode plot for the transfer function given below, and find the stability of the system.

$$G(s)H(s) = \frac{2(s+0.25)}{s^2(s+1)(s+0.5)}$$

- (ii) From the bode plot determine the phase cross over frequency, gain cross over frequency, gain Margin and phase margin. (SEMI LOG PAPER TO BE USED) (10+5=15)

2. (i) Plot the Nyquist plot to determine phase crossover frequency and gain margin for

$$G(s)H(s) = \frac{2.5K}{s(1+0.4s)(1+0.2s)}$$

- (ii) Determine phase margin for K=3.

(10+5=15)

- ③ The open-loop transfer function of a control system is given by-

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

- (b) Sketch the root locus and determine: (a) The breakaway points, (b) The angle of departure from complex poles and (c) The stability condition. (GRAPH PAPER TO BE USED).

(15)

4. What is servo-motor? What are the good requirements of servo-motors? Derive the transfer function of armature control DC servo-motor.

(15)

5. ⑥ Determine magnitude of $G(s)H(s) = \frac{32}{s(s+\sqrt{6})^3}$ at $\omega=\sqrt{2}$ rad/sec. Calculate gain margin and gain cross over frequency and Comment on stability.

- (ii) Using Routh-Hurwitz criterion determine the relation between K and T so that unity feedback control system whose open-loop transfer function given below is stable

$$G(s)H(s) = \frac{K}{s[s(s+10)+T]}$$

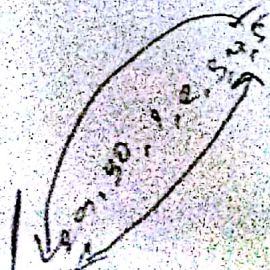
(8+7=15)

- ⑦ Using nyquist criterion investigate the closed loop stability of the system whose open loop transfer

$$G(s)H(s) = \frac{k(s+1)}{(s+0.5)(s-2)}$$

- function is, Draw its nyquist plot. Consider (i) k=1.25 (ii) k=2.5. And also determine the limiting value of k for stability.

(15)



Attempt any three questions from the following. Each question carries 5 marks

$$G(s)H(s) = \frac{1}{(s+4)(s+2)}$$

7. Sketch the polar plot for the system with open loop transfer function is on a plain paper.

8. Explain the advantages and disadvantages of D- controller with suitable example.

9. Explain briefly what are the difficulties faced while applying Routh-Hurwitz criterion?

$$G(s) = \frac{k}{s(1+0.6s)(1+0.4s)}$$

10. For a unity feedback system having forward path transfer function Determine

- (i) The range of values of k for stability
- (ii) Marginal values of k
- (iii) Frequency of sustained oscillation

Attempt all questions. Each question carries 2 marks

11. What is the effect on the polar plot if a non-zero pole is added to the transfer function?

12. Draw the log-magnitude plot of $\frac{1}{(j\omega)^2}$.

✓ 13. Define Nyquist path.

✓ 14. Define Gain margin and phase margin.

✓ 15. What is positional error constant?

Enrolment No. 16UEI003

S. (UEI05B12) EIE

B. Tech 5th Semester End-Term Examination, 2018
Electronic Instrumentation and Measurement
UEI05B12

Time: 3.00 hours

Full Marks: 100

The figures in the margin indicate full marks for the questions
Candidates are required to give their answers in their own words as far as practicable

Group-A

Attempt ALL the questions. Each question carries 2 Marks

[5×2=10]

1. Why purely mechanical instruments cannot be used for dynamic measurements?
2. List the advantages of null type instrument over deflection type instrument.
3. An 0-10 A ammeter has a guaranteed accuracy of 1 percent of full scale deflection. What is the limiting error while reading 2.5 A.
4. In measurement systems, name any two undesirable static characteristics and two desirable static characteristics.
5. A pressure gauge is calibrated from 0-50 kN/m². It has a uniform scale with 100 scale divisions. One fifth of a scale division can be read with certainty. What is the resolution of the gauge?

Group-B

Attempt ALL the questions from the following. Each question carries 5 marks. [6×5=30]

6. Describe the circuit and working of a Q meter. [5]
7. Describe the 3 stages undergone by a Phase Locked Loop. [5]
8. Explain the working principle of chopper type DC voltmeter? [5]
9. Describe in details the circuit and working of function generator. [5]
10. Calculate the value of the multiplier resistor for 10 V_{rms} ac range on the voltmeter in figure below.

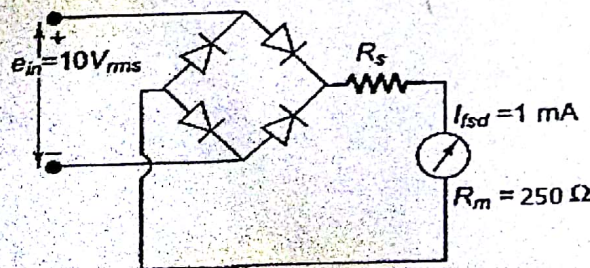


Fig. 10

11. Sketch the time domain response for second order under damped system and define the following terms along with their expressions. [1+4]

- (a) Rise time (b) Peak time (c) Peak overshoot (d) Settling time

Group-C

Attempt any 6 questions from the following. Each question carries 10 marks. [6×10=60]

12. Describe the circuits and working of wave analyzers used for audio frequency and megahertz ranges [5+5]
- ✓ 13. Explain the functioning of ramp type digital voltmeter. State the advantage of a digital voltmeter over an analog meter. [8+2]
- ✓ 14. Describe the measurement of Q factor, inductance and effective resistance using Q meter. A circuit consisting of a coil, a resistance and a variable capacitor connected in series is tuned to resonance using a Q meter. If the frequency is 500 kHz, the resistance 0.5Ω and the variable capacitor set to 350 pF. Calculate the effective inductance and resistance of the coil, if the Q meter indicates 90. [2+2+2+4]
- ✓ 15. Explain how analog multiplier is used for squaring, division, as a RMS detector, vector magnitude converter and frequency doubler with proper circuit diagram and derivation. [2+2+2+2+2]
16. Explain the functioning of a time base generator in a CRO. Also derive an expression for vertical deflection of an electron beam in a CRT. [3+7]
17. Draw the block diagram of a general purpose CRO and describe its different parts. [10]
18. Define limiting error. Write a brief note on classification of errors. [2+8]

Enrolment No. 16UEI003

S5(UEI05B10)EIE

B. Tech 5th Semester End-Term Examination 2018
Instrumentation Devices-II
UEI05B10

Full Marks: 100

Time: 3 hours

(The figures in the margin indicate full marks for the questions.)

Candidates are required to give their answers in their own words as far as practicable)

The attemptation of question number one is compulsory and any six from the rest.

1. Briefly define the following terms (any five).

- Proportional sensitivity/gain
- Newtonian and non-Newtonian fluid
- Hydraulic and pneumatic system
- Programmable transmitter
- Smart Sensor
- Viscosity
- Conductivity

(5×2=10)

2. Compare the properties of pneumatic and hydraulic system arising due to the medium they used. Compare pneumatic controllers with hydraulic controllers in terms of speed, power output, safety and effect of temperature variations. Give a comparative study among Analog, Programmable and smart transmitters.

4+6+5=15

3. Design a hydraulic proportional controller (P-control action mode). Draw the basic Flapper-Nozzle system and explain it working. What is the need of fixed orifice in a Flapper-Nozzle system?

7+6+2=15

4. Why is viscosity measurement important for industrial processes? Explain the working principle of capillary viscometer with neat sketch. Describe briefly the various types of electrodes used in pH measurement.

3+7+5=15

5. Explain the principle of working and constructional details and applications of photo-diode. Draw the characteristics. Explain the principle of working and constructional details and applications of photo-voltaic cell. Explain why it is very useful in space applications.

8+7=15

6. What is a piezo-electric effect? What are the categories of piezo-electric materials? Describe the properties of materials used for piezo-electric transducer. Mathematically derive the expressions for charge and voltage sensitivities.

3+2+2+8=15

7. Give the pin configuration of DB-9 connector. Also write down the functions of all individual pins. Explain the various advantages and disadvantages associated with pneumatic transmission over electronic transmission.

2+6+7=15

8. Explain the principle of working and constructional details and applications of light dependent resistors. A barium titanate pickup has the dimensions of 5 mm×5 mm×1.25 mm. The force applied to the pickup is 5 N. The charge sensitivity of barium titanate is 150 pC/N and its permittivity is 125×10^{-9} F/m. If the modulus of elasticity of the barium titanate is 12×10^6 N/m², calculate the strain. Also calculate the charge and the capacitance.

9+6=15

9. Write short notes on any three.

- Electronic ON-OFF controller with dead-band
- RS-232 protocol
- RS-232 vs RS-485
- Limitations of RS-232
- IEEE-488 protocol

5×3=15