Total No. of printed pages = 3

EI 1815 PE 12

Roll No. of candidate | | | | | | | | | | |

1/3/22 2021

B.Tech 5th Semester End-Term Examination

IE

ADVANCED ELECTRICAL MEASUREMENTS

(New Regulation & New Syllabus)

Full Marks – 70 Time – Three hours

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

SECTION A

Answer any *five* questions from this section. (5 × 5 = 25)

1. Define
   (a) Accuracy
   (b) Precision
   (c) Reproducibility
   (d) Sensitivity
   (e) Resolution

2. A second order instrument is subjected to a sinusoidal input. Undamped natural frequency is 3 Hz. Damping ratio is 0.5. Calculate the amplitude ratio and phase angle for an input frequency of 2Hz. Deduce the equations used for calculation.

3. What is an electrical transducer? How are they classified? List the various types of electrical transducers used for industrial measurements.

4. Explain various factors to be considered during selection of a transducer for a specific application.

5. What are the advantages and disadvantages of using Electronic Voltmeters?

6. Draw the circuit of a practicalQ-meter. A coil with a resistance of 6 ohm is directly connected to the test terminal. For a 120 pF capacitance of the tuning capacitor the resonance is obtained at the oscillator frequency of 1 MHz. Calculate the percentage error introduced in the calculated value of Q by the 0.01 ohm insertion resistance.

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7. What are the different scales of temperature measurement? Give the relationship between the different scales.

8. Explain the construction and working of the LVDT with a neat sketch. What is a DCDT and RVDT?

9. A well type mercury manometer is to have a float in the left hand chamber. An electromechanical transducer is used to measure the motion of the fluid. The float motion is 5 mm for a gauge pressure of 50 kN/m^2. If the diameter of the float chamber is 40 mm, find the required diameter for the right-hand chamber. For mercury density is 13600kg/m^3. Assume that the other end of the manometer is open to the atmosphere. Deduce the equations used for calculation.

SECTION B

Answer any *five* questions from this section. (5 × 7 = 35)

10. What is a thermistor? Why is the thermistor said to be at least 10 times more sensitive than the platinum resistance element. Give its advantages and disadvantages.

11. Describe the in line rotating torque sensor with neat sketches.

12. Describe the strain gauge pressure transducer with neat sketches. Give its advantages and disadvantages.

13. Show that the U-tybe manometer is a second order instrument.

14. What is a recorder? Describe the Strip Chart Recorder with neat relevant sketches.

15. Discuss the dynamic characteristics of piezoelectric transducers. Give the applications of these transducers.

16. In a balanced resistance strain gauge show that the output emf is related to the axial strain in the four resistances of the Wheat stone bridge. Draw the Thevenin's equivalent circuit and calculate the current through the galvanometer.

17. What is a thermocouple? Give the working principle and laws which govern the operation of a thermocouple. What are the advantages afforded by TC sensors?

18. For the Hot-Wire Anemometer find the equation for the turbulence level measurement starting from the King's Law for convective heat transfer from the heated wire. What kind if flow measurement is this instrument commonly used for?

SECTION C

Write short notes on any *two* from this section. (2 × 5 = 10)

19. RTD

20. RMS responding AC EVM

21. Digital Storage Oscilloscopes

22. Utrasonic flow meters

23. Tachometer Generators