EI 1815 PE 12   06/01/2023

Roll No. of candidate [ ][ ][ ][ ][ ][ ][ ][ ][ ]

2022

B.Tech. 5th Semester End-Term Examination

IE

ADVANCED ELECTRICAL MEASUREMENTS

(New Reg. and New Syllabus)

Full Marks – 70   Time – Three hours

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

Answer Question No. 1 and any *four* from the rest

1. Answer the following questions : (Fill in the blanks)   (10 × 1 = 10)

   (a) Accuracy is ――――― while Precision is ―――――

   (b) Static Characteristics are defined as ―――――

   (c) Two desirable dynamic characteristics are ―――――

   (d) Displacement of the tip of a C-type Bourdon Tube is given by ―――――

   (e) Two disadvantages of an LVDT are ―――――

   (f) The different scales used for temperature measurement are ―――――

   (g) Three applications of the magnetic drag type tachometer are ―――――

   (h) The electromagnetic flowmeter measures the rate of flow of ―――――

   (i) Different types of AC Electroncis Voltmeters are ―――――

   (j) A Digital Storage Oscilloscope is an instrument which ―――――

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2. (a) 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. (5)

   (b) 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. (5)

   (c) What are the advantages of electronic voltmeters? Write the principle of working of a RMS responding voltmeter. (5)

3. (a) Describe a (i) Ramp type and (ii) Integrating type DVM with relevant figures, advantages and disadvantages. (10)

   (b) What are the applications of a CRO in an Industrial Environment? (5)

4. (a) Mention the difference between a Strip-Chart Recorder and an X-Y Recorder. Give the working principle of the X-Y Recorder and describe it with the help of a block diagram. (5)

   (b) Give the relationship between the different scales of temperature measurement. 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? (10)

5. (a) Show that the U-tube manometer is a second order instrument.

   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/m². If the diameter of the float chamber is 40 mm, find the required diameter for the right-hand chamber, for mercury density is 13600kg/m³. Assume that the other end of the manometer is open to the atmosphere. Deduce the equations used for calculatio. (5+5)

   (b) Discuss the dynamic characteristics of piezoelectric transducers. Give three applications of these transducers. (5)

6. (a) Describe with neat figures (i) AC Tachometer (ii) DC Tachometer. (5+5)

   (b) Describe the Hall Effect transducer with a neat figure. State its application, two advantages and two disadvantages. (5)

7. (a) What are the different types of electric flowmeters? Explain with a figure how the beat frequency in the oscillatory loop method of an Ultrasonic flowmeter is made directly proportional to flow velocity. (5)

   (b) For the Hot-Wire Anemometer find the equation for the turbulence level measurement starting from the Kings Law for convective heat transfer from the heated wire. What kind if flow measurement is this instrument commonly used for? (10)

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