AE-107

April-2016

B.Sc., Sem.-VI

CC-310 : Electronics

Time : 3 Hours]　　　　　　　　　　　　　　　　　　　　[Max. Marks : 70

Instructions : (1) All questions are compulsory and carry equal marks.

　　　　　　　　(2) Symbols have their usual meaning.

1. (a) Write displacement transducers. Explain capacitive transducer. Write advantages and disadvantages of capacitive transducer. **5**

OR

Write temperature transducer. Explain the thermistor and characteristics of thermistor. Write two applications of thermistor.

(b) What is strain gauge ? Define gauge factor. Obtain an equation for gauge factor in terms of Poisson's ratio. **5**

OR

What is difference between photo-emissive, photo conductive and photovoltaic cell ? Explain construction and working of gas filled phototube.

(c) A strain gauge is bonded to a beam of length 12 cm and cross-sectional area 3.8 cm². The unstrained resistance and gage factor of the strain gage are 120 Ω and 2.2 respectively. The resistance of gage changes by 0.02 Ω when load is applied. If the modulus of elasticity of steel is 207 GN/m², calculate : **4**

(i) The change in length of a steel beam.

(ii) The amount of force applied to beam.

OR

A parallel plate capacitor transducer uses plates of area 300 mm² which are separated by a distance of 0.2 mm. Determine the value of capacitance when the dielectric is air having a permittivity of 8.85×10^{-12} F/m. Also determine change in capacitance if a linear displacement reduces the distance between the plates is 0.16 mm.

2. Attend any **two** of the following :

(a) Classify the discrete time signal.

Discuss

   (i) Deterministic and non-deterministic signal

   (ii) Odd and Even signal

(b) Explain Amplitude and phase spectra. Sketch the single sided and double sided amplitude and phase spectra of the signal

$$x(t) = 4 \sin\left(10\pi t - \frac{\pi}{6}\right) - \alpha < t < \alpha$$

(c) Write definition of Z transform. Write convolution property of Z transform and compute the convolution $x(n)$ of the signal.

$$x_1(n) = \{4, -2, 1\}$$

$$x_2(n) = \begin{cases} 1 & 0 \le n \le 5 \\ 0 & \text{otherwise} \end{cases}$$

(d) Define the inverse Z transform. Write three basic methods of performing the inverse Z transform. Explain any one method.

3. Attempt any **two** of the following : 14

(a) Obtain the solution of Laplace equation in rectangular coordinates.

(b) Obtain the Maxwell's equation and discuss the displacement current term.

(c) Discuss the polarization of Electromagnetic waves with necessary equations.

(d) Explain Hysterisis loop in detail.

4. Explain drift under electric field, diffusion and generation recombination. Derive the continuity equation. Write applications of continuity equation. 14

OR

(i) Obtain an expression for conductivity of semiconductor in terms of charge carries densities and their mobilities. 7

(ii) Explain carrier transport under drift. 7

5. Answer in brief :

(1) Write disadvantage of piezoelectric transducer.

(2) What is RTD ?

(3) What is LVDT ?

(4) Write basic difference between active and passive transducer.

(5) Find the Z transform of $x(n) = \{1, 2, \overset{\uparrow}{5}, 0, 3\}$

(6) What is singularity function ?

(7) Define unit ramp function.

(8) Define static system.

(9) What is ROC ?

(10) Write manipulation of discrete time signal.

(11) Write Poisson's equation.

(12) What is hysterisis ?

(13) What is Einstein relation ?

(14) Define Intrinsic semiconductor.

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