SL-106

September-2020

B.Sc., Sem.-VI

CC-310 : Electronics

Time : 2 Hours] [**Max. Marks : 50**

Instructions : (1) **All** Questions in Section-I carry equal marks.

(2) Attempt any **three** questions in Section-I.

(3) Question **9** in Section-II is compulsory.

SECTION – I

1. (a) What is strain gauge ? Explain how does it work and derive the expression for gauge factor. $K = \dfrac{\Delta R/R}{\Delta l/l} = 1 + 2\mu$ **10**

   (b) A resistance strain gauge with a gauge factor 2 is fastened to steel member subjected to a stress of 1000 Kg/cm^2. The modulus of elasticity of steel is approximately 2×10^6 Kg/cm^2. Calculate the percentage change in resistance 'ΔR' of the strain gauge element due to the applied stress. **4**

2. (a) Explain LVDT (linear variable differential transducer) in detail. **7**

   (b) What is the difference between a photo-emissive, a photo-conductive and a photo-voltaic cell ? Name one application for each. **7**

3. (a) Do as directed :

   (i) Define Periodic and Aperiodic signals. If $x_1(t) = \sin 10\pi t$ and $x_2(t) = \sin 40\pi t$; then check the periodicity of $x(t) = x_1(t) + x_2(t)$. **3**

   (ii) Sketch the signal : $x(t) = \pi(2t + 7)$. **3**

   (iii) Sketch the signal : $x(t) = 2\,[u(t) - u(t - 2)] + [u(t - 3) - u(t - 5)]$ **2**

   (iv) By applying folding process, sketch :

   $x(-n)$ for $x(n) = \{1, 2, 1, -1, 1, 2, 1, -1, 1, 2\}$ **2**

   (b) Draw the block diagram representation for the response of the system.

   $$y(n) = x(n) + 3x(n - 1) + 2x(n - 2)$$

   If the input sequence is $x(n) = \{0, 1, 1, 2, 0, 0, 0....\}$, obtain the response of the system $y(n)$. **4**

4. (a) Find the Z-transform for $x(n) = n^2 u(n)$. **7**

   (b) Using long division method, determine the inverse Z-transform of **7**

   $$X(z) = \dfrac{1}{1 - \dfrac{3}{2}z^{-1} + \dfrac{1}{2}z^{-2}}\ \text{when ROC} : |z| > 1$$

5. (a) Obtain general solution of Laplace equation in rectangular coordinate system. **7**

   (b) Obtain Maxwell's equations and discuss displacement current term. **7**

6. (a) Derive the Lorentz condition and show that scalar and vector potentials satisfy same type of equations. **7**

   (b) Discuss radiation pressure and momentum of electromagnetic waves. **7**

7. (a) Discuss the drift motion of electron in the presence of electric field. **6**

   (b) Explain the diffusion of holes in N-type semiconductor and obtain expression for current density. **8**

8. (a) Explain only generation and recombination process and derive $\left(\dfrac{\partial n}{\partial t}\right)_{gr}$ for p type Semiconductor. **6**

   (b) Obtain the Einstein relation for motion of majority carriers in P type semiconductor. Also discuss built in voltage. **8**

SECTION – II

9. Attempt any **eight** : **8**

   (A) What causes multiplicative currents in gas filled tube ?

   (B) Why thermistor is called transducer ?

   (C) What are self-generating transducers ?

   (D) What are non-electrical quantities and electrical quantities in oscillation transducer ?

   (E) What is state variable technique ?

   (F) Determine the region of convergence for $x(n) = \delta(n - 2)$.

   (G) Write the expression of Z-transform for non-causal sequence.

   (H) Write statement of initial value theorem.

   (I) Why electromagnetic waves are called transverse waves ?

   (J) What is Hysteresis ?

   (K) Define circularly polarised electromagnetic waves.

(L) What is poynting vector ?

(M) What is the meaning of negative effective mass in semiconductor ?

(N) Give the difference between semiconductor and insulator.

(O) What is P-type semiconductor ?

(P) Which type of impurities are added in semiconductor to form n-type semiconductor ?

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