AJ-117

April-2017

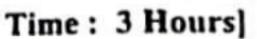### B.Sc., Sem.-VI

CC-310 : Electronics

(Physics of Electronics)

Time : 3 Hours]   [Max. Marks : 70

Instructions : (1)   All questions carry equal marks.

(2)   Symbols have their usual meanings.

1. (a)   Name four types of electrical pressure transducers and describe linear variable   **7**
       differential transducer in detail.

       OR

       Discuss the role of thermistor in measurement and control of temperatures.

   (b)   Explain working of multiplier phototube with necessary diagram.   **7**

       OR

       Write a note on thermocouple as temperature measuring device.

2. (a)   Write a note on singularity functions and sketch the following signal   **7**
       $$x(t) = \pi (2t + 3)$$

       OR

       Write linearity property of z transform and find the z transform for
       $$x(n) = \sin w_0 n \text{ for } n \geq 0$$

   (b)   Do as directed.

       (i)   Check the linearity of following system.
       $$\frac{3dy(t)}{dt} + 5y(t) + 8 = x(t)$$ **3**

       (ii)   For $y(n) = x(n) + 2x(n - 1) + 4x(n - 2)$. Draw the block diagram
           representation of the system and for input sequence $x(n) = \{1, 0, 1, 0, 1, 0,$
           $0, ...\}$. Obtain the output sequence $y(n)$.   **4**

           OR

       Using long division method determine the inverse z-transform of
       $$x(z) = \frac{1}{1 - \left(\frac{3}{2}\right) z^{-1} + \left(\frac{1}{2}\right) z^{-2}}$$

       when ROC : $|z| > 1$

3. (a) State and explain uniqueness theorem.

OR

What is Hysteresis ? Show that energy dissipated per unit volume in each cycle is proportional to the area enclosed by the hysteresis loop.

(b) Show that time variations in $\vec{E}$ and $\vec{H}$ propagate with same velocity in non-conducting medium. 7

OR

Explain polarization of electromagnetic waves in detail.

4. (a) Discuss band theory using collective approach. 8

OR

Explain diffusion of carriers in n-type semiconductor.

(b) Consider a bar of p type semiconductor uniformly doped and uniformly irradiated by radiation of appropriate frequency. If irradiation is abruptly shut off at t = 0, calculate the concentration of minority carrier at time t using continuity equation. 6

OR

Obtain Einstein relation for motion of majority charge carrier in p type semiconductor when doping is not uniform.

5. Write short answers for following questions : 14

(1) Write the principle of Potentiometric transducer.

(2) Draw the V→I characteristic curve for thermistor.

(3) Name different photosensitive devices. (any **three**)

(4) Define causal system.

(5) What is LTI system ?

(6) Find the z-transform for $\delta(n - 8)$

(7) Find the z-transform for $x(n) = 4$

(8) Write Maxwell's equations.

(9) Write Poisson's equation.

(10) Why electromagnetic waves are called transverse waves ?

(11) Write Laplacian operator in spherical polar coordinate system.

(12) What is intrinsic semiconductor ?

(13) Give examples of materials that are semiconductor.

(14) Define mobility with reference to motion of charge carriers in semiconductor.

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AE-111

April -2018

B.Sc., Sem.-VI

CC-310 : Electronics

Time : 3 Hours]   [Max. Marks : 70

Note : (1) **All** questions carry equal marks.

(2) Symbols used here have their usual meaning.

(3) Figures to the right indicate marks.

1. (a) Write displacement transducer. Explain Linear variable Differential Transformer Transducer (LVDT) with necessary diagrams. Write advantages and disadvantages of LVDT.   7

OR

Explain thermistor. Explain its characteristics with necessary diagrams. Write two applications of thermistor.

(b) Name different photosensitive devices. Explain photomultiplier in detail.   7

OR

Explain piezoelectric transducer. Write advantages and disadvantages of piezoelectric transducer.

2. (a) Classify the system. Explain stable and linear system. Check the linearity of the system represented by following differential equation :   8

$$\frac{dy(t)}{dt} + y(t) + 4 = x(t)$$

OR

Write the methods to perform the inverse Z transform. Explain one of them. Determine the input sequence $x(n)$ if a system has input response $h(n) = \{1, 2, 3\}$ and output response $y(n) = \{1, 1, 2, -1, 3\}$.

(b) Write the answers of following questions :   6

(i) If $x_1(n) - \sin 5\pi t$, $x_2(n) = \sin 20\pi t$. Check the periodicity of $x_3(t) = x_1(t) + x_2(t)$.

(ii) Sketch the signal $x(t) = 4\pi \left(t - \frac{1}{4} \right)$

(iii) Sketch the double sided amplitude and phase spectra for

$$x(t) = 12 \sin \left(10\, \pi t - \frac{\pi}{6} \right) \qquad -\alpha < t < \alpha.$$

OR