

Seat No. : _____

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

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

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

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

OR

- (i) Compute the convolution $x(n)$ of the signal
 $x_1(n) = \{4, -2, 1\}$
 $x_2(n) = \begin{cases} 1 & , 0 < n < 5 \\ 0 & , \text{otherwise} \end{cases}$
- (ii) Determine the cross correlation sequence $r_{x_1 x_2}$ of
 $x_1(n) = (1, 2, 3, 4)$
 $x_2(n) = (4, 3, 2, 1)$
- (iii) Write linearity properties of Z transform. Determine the Z transform of the signal $x(n) = \delta(n + 1) + 3\delta(n) + 6\delta(n - 3) - \delta(n - 4)$.
3. Attempt any **two** of the following : 14
- (i) State and explain uniqueness theorem.
- (ii) What is hysteresis ? Show that energy dissipated per unit volume in each cycle is proportional to area enclosed by the hysteresis loop.
- (iii) Derive Maxwell's equation and explain displacement current term.
- (iv) Discuss the polarization of electromagnetic waves with necessary equations.
4. (a) Obtain an equation for conductivity of semiconductor in terms of charge carriers densities and their mobilities. 7
- OR**
- Explain drift under electric field and diffusion for derivation of continuity equation.
- (b) Explain band theory from collective approach. 7
- OR**
- Obtain the Einstein relationship for motion of majority carriers in P type semiconductor.
5. Answer in short : 14
- (1) Define transducer.
- (2) Which gas is filled in gas filled phototube ?
- (3) What is RTD ?
- (4) Write force summing devices.
- (5) Write basic difference between active and passive transducer.
- (6) Define even signal.
- (7) Find the Z transform of $\{1, 2, 5, 4, 0, 1\}$
- (8) Write two properties of ROC.
- (9) Define unit ramp function.
- (10) Write Poisson's equation.
- (11) Define Intrinsic semiconductor.
- (12) What are the two conduction processes in semiconductor ?
- (13) Write ferromagnetic substances.
- (14) Draw energy band diagram for conductor and insulator.