

|         |  |  |  |  |  |  |  |  |  |  |
|---------|--|--|--|--|--|--|--|--|--|--|
| H.T NO. |  |  |  |  |  |  |  |  |  |  |
|---------|--|--|--|--|--|--|--|--|--|--|

**MLR15**

Code: A10406

## **MLR INSTITUTE OF TECHNOLOGY**

(An Autonomous Institution)

II B.Tech I Sem Supplementary Examination, January-2017

### **SIGNALS AND SYSTEMS**

(ECE)

Time: 3 Hours.

Max. Marks: 75

Note: 1. This question paper contains two parts A and B.

2. Part- A is Compulsory which carries 25 marks. Answer all Questions in part A.

3. Part – B consists 5 units. Answer any one question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

#### **PART - A**

1. a) What is the condition for orthogonality between two periodic signals. [2M]
- b) Explain the effect of under sampling and over sampling [2M]
- c) Define transfer function of an LTI system [2M]
- d) Find the convolution between the signals  $x_1(t)=e^{-2t} u(t)$  and  $x_2(t)=e^{-4t} u(t)$  [2M]
- e) What is meant by ROC of Z transforms. [2M]
  
- 2 a) Sketch the following signals i)  $\pi(\frac{t-1}{2})$  ii)  $\pi(\frac{-t-1}{2})$  [3M]
- b) State and prove the Time shifting property of the Fourier Transform [3M]
- c) Check the linearity and time variance of the following system  $y(t) = x^2(t)$ . [3M]
- d) State and Prove the convolution property of signal. [3M]
- e) State the Linearity property of Z transforms with their ROCs. [3M]

#### **PART –B**

- 3) a) State and Prove any three properties of Impulse Function [5M]
- b) Prove that the signals  $\cos n\omega_0 t$  and  $\sin m\omega_0 t$  are orthogonal over the period  $[t_0$  to  $t_0+2\pi/\omega_0]$  [5 M]

**OR**

- 4) Find the Trigonometric Fourier series of a Triangular signal of maximum amplitude of A and period of T. Draw its amplitude and phase spectrum. [10M]
- 5 a) Find the Fourier transform of  $e^{-at}u(t)$ . [5M]
- b) State and prove the sampling Theorem for low pass signals. [5M]

**OR**

6. State the following properties of the Fourier Transform and apply it on any one of the signals as explain its importance.

- (i) Time shifting property.
- (ii) Time scaling property. **[10M]**

7 a) An LTI system Transfer function is given as  $1/(j\omega + 3)$ . Find the output of the system for an input of  $(0.5)^t u(t)$ . **[5M]**

b) Derive the relationship between bandwidth and rise time of a system. **[5M]**

**OR**

8 a) Draw the ideal characteristics of low pass, high pass, Band Pass and Band rejection filter. **[6M]**

b) Prove that the output of an LTI system is given as convolution if input signal and impulse response of the system. **[4M]**

9 a) State and Prove Parsvels theorem. **[5M]**

b) Write the differences between Auto correlation and Cross correlation. **[5M]**

**OR**

10 a) Determine the relation between Auto correlation function and Energy/Power Spectral density. **[5M]**

b) Explain the process of extraction of signal from noise by filtering . **[5M]**

11 a) Draw the wave form for the following expression  
 $x(t) = 3u(t+2T) + 2u(t+T) + r(t+T) - r(t-T) - 2u(t-T) - 3u(t-2T)$  **[5M]**

b) Find the Laplace transform of the following signals  
(i)  $x(t) = tu(t)$                       (ii)  $x(t) = \sin at u(t)$  **[5M]**

**OR**

12 a) Find the Z transform of the following signals with their ROCs

(i)  $x(n) = u(n)$     (ii)  $x(n) = 2^n u(n)$  **[5M]**

b) Find the inverse Z transform of  $X(Z) = 1 / (Z^2 - Z - 6)$  **[5M]**

\*\*\*\*\*