Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

Seat No.	

[5057]-2042

S.E. (E&TC/Electronics) (First Semester)

EXAMINATION, 2016

SIGNALS AND SYSTEMS

(2015 PATTERN)

Time : Two Hours **Maximum Marks : 50**

N.B. :— (*i*) Attempt Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** and Q. **7** or Q. **8**.

(*ii*) Figures to the right indicate full marks.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Assume suitable data, if necessary.

1. (*a*) Find whether the following signals are energy or power and find the corresponding value : [4]

$$x(t) = (½)^n . u[n]$$

(*b*) Find the convolution between : [4]

$x[n] = \{1, 1, 1, 1\}$ and

$h[n] = \{1, 1 1, 1\}$

(*c*) Find odd and even components of the signal : [4]

$$x[n] = u[n] - u[n-4].$$

P.T.O.

Or

2. (*a*) An analog signal is given by the equation :

$$x(t) = 2 \sin 400\pi t + 10 \cos 1000\pi t .$$

It is sampled at sampling frequency 1000 Hz.

(*i*) What is the Nyquist rate for the above signal ?

(*ii*) What is the Nyquist interval of the signal ? [2]

(*b*) Find the convolution between :

$$x(t) = u(t) \quad \text{and}$$

$$h(t) = u(t-2)$$

using graphical method. [6]

(*c*) Check whether the following signal is periodic or non-periodic. If periodic, find period of the signal : [4]

$$x(t) = \cos(n / 8).\cos(n\pi / 8) .$$

3. (*a*) State and explain the properties of Continuous Time Fourier Series. [6]

(*b*) Determine the transfer function and impulse response for the system described by the differential equation shown below for zero initial conditions : [6]

$$d / dt\,[y(t)] + 3\ y(t) = x(t) .$$

Or

4. (*a*) Draw the magnitude and phase spectrum of the signal : [6]

$$x(t) = 5\cos(2\pi 10t + 30) - 10\cos(2\pi 20t + 60).$$

(*b*) Find the Fourier transform of the signal : [6]

$$x(t) = \sin \omega_c t.u(t).$$

5. (*a*) State and prove convolution property of Laplace transform. [6]

(*b*) Find the initial and final value of : [7]

$$X(s) = 5s + 50 / s(s+5).$$

Or

6. (*a*) Find the Laplace transform of the given signal and draw its ROC : [6]

$$x(t) = -e^{at}u(-t).$$

(*b*) Find the inverse Laplace transform of : [7]

$$X(s) = 3s + 7 / (s^2 - 2s - 3).$$

7. (*a*) List the properties of auto correlation and cross correlation for energy signals. [6]

(*b*) A perfect die is thrown. Find the probability that : [7]

(*i*) You get even number.

(*ii*) You get a perfect square.

Or

8. (*a*) List the properties of probability. Explain conditional probability with an example and formula. [6]

(*b*) A three digit message is transmitted over a noisy channel having a probability of error as P(E) = 2/5 per digit. Find and draw the CDF. [7]