14EC304

Hall Ticket Number:

II/IV B.Tech (Regular) DEGREE EXAMINATION

OCTOBER, 2016 — **Electronics and Communications Engineering**

Third Semester — **Signals and Systems**

Time: Three Hours — **Maximum :** 60 Marks

Answer Question No.1 compulsorily. (1X12 = 12 Marks)

Answer ONE question from each unit. (4X12=48 Marks)

1. Answer all questions (1X12=12 Marks)

a Define a signal and system.

b List the properties of unit impulse function.

c What is the fundamental period of $x(t) = \cos(20\pi t)$.

d What are Bandlimited signals?

e If $y(t) = \delta(t) * rect(t)$, then $y(t) = ?$

f State Dirichlet's conditions.

g What is the Fourier transform of $\delta(t)$?

h State multiplication property of Fourier transforms.

i What is frequency response?

j What is sampling?

k Define Correlation.

l What is energy spectral density?

UNIT – I

2.a Graph the following functions: 3 X 2 = 6 M

$i.\ g(t) = 5\,sgn(t-4)$

$ii.\ g(t) = 5\,r(t+1)$

$iii.\ g(t) = 5\,e^{-t/4}\,u(t)$

2.b Check whether the following systems are Static, Linear, Causal, Time invariant. 3 X 2 = 6M

$i.\ \frac{d\,y(t)}{dt} + 3\,t\,y(t) = t^2\,y(t)$

$ii.\ y(t) = A\,x(t) + B$

$iii.\ y(t) = \int_{-\infty}^{t} x(T)dT$

(OR)

3.a Find the Energy and Power of these signal: 2 X 3 = 6M

$i.\ x(t) = A\,rect(t) + B\,rect(t-0.5)$

$ii.\ x(t) = A\,[u(t) - u(t-10)]$

3.b Check whether the following systems are Static, Linear, Causal, Time invariant. 3 X 2 = 6M

$i.\ \frac{d^3y(t)}{dt^3} + 4\,\frac{d^2y(t)}{dt^2} + 5\,\frac{d\,y(t)}{dt} + 2\,y^2(t) = x(t)$

$ii.\ y(t) = sgn(x(t))$

$iii.\ y(t) = x(t^2)$

UNIT – II

4.a Derive the relation between trigonometric Fourier series and exponential Fourier series. 4 M

4.b Represent Direct Form I and Direct Form II realizations of the systems described by these functions 2 X 4 =8M

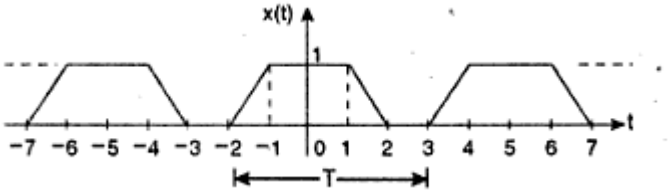
$i.\ 2\,y(t) + 3\,\frac{d\,y(t)}{dt} - 5\,\frac{d^2\,y(t)}{dt^2} = x(t)$

$ii.\ 11\,y(t) + 9\,\frac{d\,y(t)}{dt} = \frac{d\,x(t)}{dt} + 4\,\frac{d^2\,x(t)}{dt^2}$

(OR)

5.a Two systems have impulse responses $h_1\,(t) = u(t) - u(t-10)$ and $h_2\,(t) = rect(\frac{t-2}{4})$. If these two systems are connected in cascade, graph the response $y(t)$ of the overall system to $x(t) = \delta(t)$. 6 M

5.b Derive the exponential Fourier series coefficients for the signal shown below. 6 M



UNIT – III

6.a Compute the Continuous time Fourier Transform of the following: 2 X 3 = 6 M

$i.x(t) = rect(t)$

$ii.x(t) = tri(t)$

6.b State and Prove the following properties of Continuous time Fourier Transforms. 2 X 3 = 6 M

i. Frequency shifting
ii. Convolution

(OR)

7.a A system has an impulse response $h_1(t) = 3\,e^{-10\,t}\,u(t)$ and another system has impulse response $h_2\,(t) = \delta(t) - 3\,e^{-10\,t}\,u(t)$. Graph the magnitude and phase response of the frequency response of these systems in a parallel connection 6M

7.b Compute the Continuous time Fourier Transform of the following: 2 X 3 = 6 M

$i.x(t) = \cos(2\,\pi\,t)$

$ii.\ x(t) = A\,[\,u(t) - u(t-10)]$

UNIT – IV

8.a Compare Energy Spectral Density and Power Spectral Density. 4M

8.b State and prove sampling theorem for low pass signals. 8 M

(OR)

9.a Compute $R(\tau)$ and $\Psi(w)$ for the signal$x(t) = e^{-at}\,u(t)$. 6M

9.b Show that Cross Correlation and Auto Correlation exhibits conjugate symmetry 6M