B.E / B.Tech (Part Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2014

ELECTRONICS AND COMMUNICATION ENGINEERING

SECOND SEMESTER

PTEC 232/274/ **PTEC9203 SIGNALS AND SYSTEMS**

(Regulation 2009)

Time : 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. Determine whether the given signal is periodic. If periodic, find the fundamental period of the signal

   $x[n] = \cos\left(\frac{\pi}{4} n\right)$

2. Evaluate

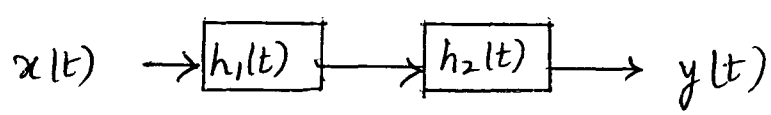
   $y(t) = \int_{-\infty}^{t} \cos t\, u(t-1)\, \delta(t)\, dt$

3. State Parseval's theorem
4. What is an invertible system
5. What is meant by 'state' of a system
6. Draw the block diagram representation of the system given by

   $\frac{dy(t)}{dt} + 2y(t) = x(t)$

7. Give the relation between DTFT and z transform
8. State uniform sampling theorem.
9. What is the output of the system given in fig.Q9

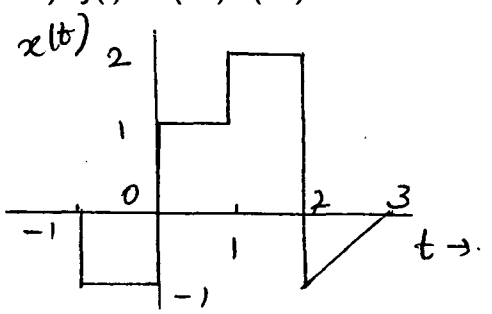
Fig. Q9



10. What is a non recursive system?

Part – B (5 x 16 = 80 marks)

11. i) Signals x(t) and h(t) are given in fig. Q.11. Sketch
    a) y(t) = x(t-1) h(1-t) b) x(2- t) h(t+4) (3+3)



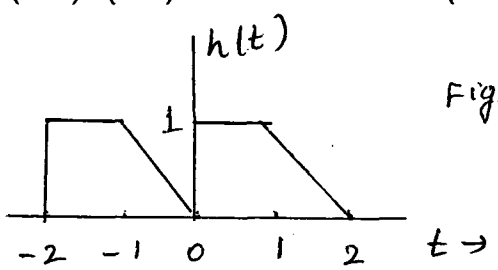


Fig.Q11

ii) A system has the input and output related by y[n] = n x[n]. Find whether the system is
a) memoryless b) causal c) time invariant (2+2+2)

iii) Determine whether the given signal is energy signal or power signal

$x[n] = (-0.5)^n u[n]$ (4)

12. a) i) State Dirichlet's conditions (4)

ii) Evaluate the complex Fourier series representation of $x(t) = \sin^2 t$ and plot (4)

iii) Find the Fourier transform of the signal given in fig.Q12.a (8)

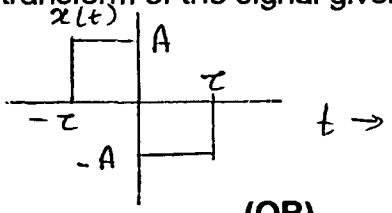


Fig. Q12.a

(OR)

12.b) i)Give the modulation property of Fourier transform. Specify an application of the same. (4)

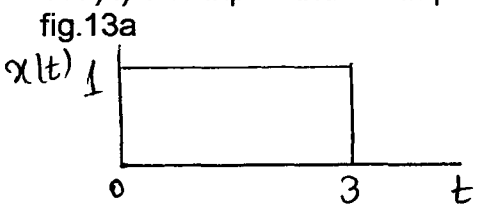
ii) Given $X(j\omega)$ is the Fourier transform of $x(t)$, using the properties of the Fourier transform determine the Fourier transform of

$$x_1(t) = \frac{d^2(x(t-1))}{dt^2}$$ (4)

iii) Find the Laplace transform of the given function and plot the ROC with pole zero pattern

$x(t) = e^{2t} u(t) + e^{-3t} u(-t)$ (4+4)

13a) i) The input and the impulse response of a CT-LTI system are given in fig.13a



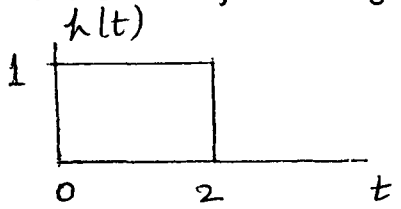


Fig. Q13a

Find the output y(t) of the system (10)

ii) A CT-LTI system is given by

$$\frac{dy(t)}{dt} + 2y(t) = x(t)$$

Using Fourier transform find the frequency response of the system (6)

(OR)

13.b) i) The output y(t) of a CT-LTI system is found to be $2e^{-3t} u(t)$ when the input is u(t). Find the output when the input is $e^{-t} u(t)$ (10)

ii) The transfer function of a system is given by

$$H(s) = \frac{(s-1)}{(s+1)(s-2)}$$

Find h(t) for the system to be causal and stable. (6)

14.a) i) Find the DTFT of the signal given by

$x[n] = a^n u[n]$ (8)

ii) Find the output of the system if the input x[n] = { 1,2,3,-5,0,1,3} and the impulse response is h[n] = { 1,1,1,0,1,1,0}. Also plot the output (8)

(OR)

14 b) i) Determine the right sided sequence if

$$X(z) = \frac{1}{1+\frac{1}{2}z^{-1}}, \quad |z| > 1/2$$

Use power series expansion method (8)

ii) Find the z-transform of (8)

$$x[n] = \left(\frac{1}{4}\right)^n \cos\left(\frac{\pi}{8}n\right) u(n)$$

15 a) i) Draw the direct form –II structure of the given DT- LTI system whose transfer function is given by (8)

$$H(z) = \frac{1-\frac{5}{6}z^{-1}}{\left(1-\frac{1}{4}z^{-1}\right)\left(1-3z^{-1}\right)}$$

ii) A causal DT-LTI system is described by the difference equation

$$y[n] - (3/4)\, y[n-1] + (1/8)\, y[n-2] = x[n]$$

where y[n] and x[n] are the output and input of the system respectively. Determine the impulse response and the transfer function of the system (8)

(OR)

15 b) i) The frequency response of a DT-LTI system is given by

$$H(e^{j\omega}) = \frac{2}{\left(1-\frac{1}{2}e^{-j\omega}\right)\left(1-\frac{1}{4}e^{-j\omega}\right)}$$

Find the impulse response of the system (8)

ii) Find the state equations of DT system given by the equation

$$y[n]+2\, y[n-1] + y[n-2] = x[n]$$ (8)