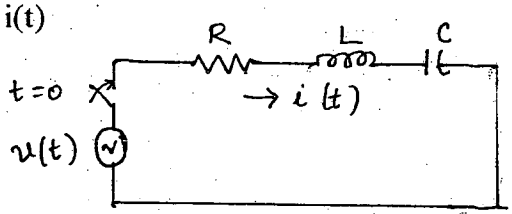
B.E.DEGREE EXAMINATION, APRIL / MAY 2007
INFORMATION TECHNOLOGY – REGULATIONS : R2002
FOURTH SEMESTER
PTEC 232 – SIGNALS AND SYSTEMS

Time : 3 hours **Maximum Marks : 100**

Answer all questions

PART – A **10 x 2 = 20 Marks**

1. Determine whether the signal is periodic or not. If periodic, find the period of the same
   i) $x(t) = 2\cos(3t + \pi/4)$ ii) $x[n] = \cos(n/4)\cos(\pi n/4)$
2. Determine whether the given system is shift invariant
   $y[n] = x[n^2]$
3. What are Dirichlet's conditions
4. State Parseval's theorem
5. Get the differential equation of the system (fig. below) relating its input and the response i(t)



6. Write the relation between Fourier transform and Laplace transform
7. Find the poles of the system given by

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

8. The transfer function of a system is given by

$$H(s) = \frac{(s+1)}{(s^2+5s+6)}$$

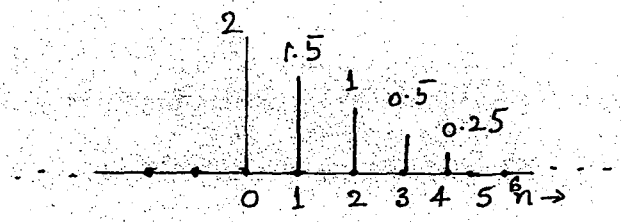
   Is the system stable?

9. Find the convolution of the two sequences x[n] and h[n] given by
   $x[n] = \{0, \underset{\uparrow}{1}, 2, 3, 4\}$ and $h[n] = \{1, -1, \underset{\uparrow}{5}, 3, -2, 3\}$

10. Get the z transform of an impulse function

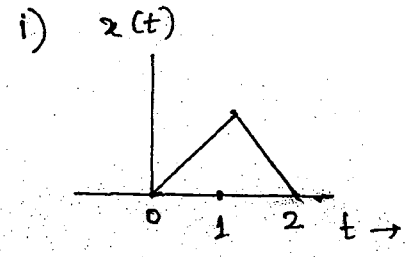
PART – B **(5 x 16 = 80 Marks)**

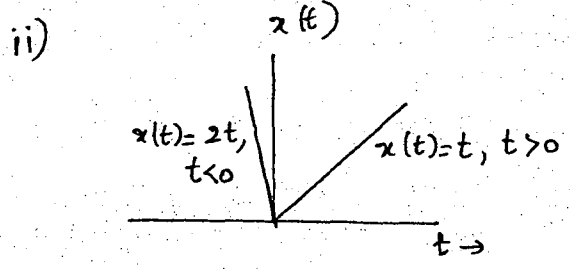
11. a)I) Find the following if $x_1[n]$ and $x_2[n]$ are given as below.
    $x_1[n] = u[n] - u[n-2]$



i) $x_1[2n-1]$ ii) $x_1[n^2]$ iii) $x_2[n+1]\{x_1[n+3] - x_1[-n]\}$ iv) $x_2[-n+1]$

II) Find the odd and even parts of the signals shown below





III) Determine which system is causal

i) $y[n] = x^2[n]u[n]$ ii) $y[n] = x[n+1]+x[n-3] + x[n-10]$

(6+6+4)

12a)i) Given X(jω) is the Fourier transform of x(t), determine the Fourier transform of

I) $x_1(t) = d^2x(t-1)/dt^2$ II) $x_2(t) = x(3t-6)$

ii) Verify frequency shifting property of Fourier transform. Mention its application

(8+8)

(OR)

12b) i) Find the Laplace transform of $x(t) = e^{-t}u(t) + e^{-2t}u(t)$. Also find its ROC

ii) Determine the complex exponential Fourier series representation of

I) e^{j200t} II) cos4t + sin6t

(8+8)

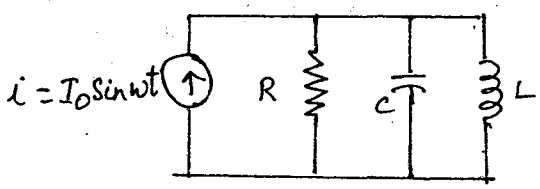
13a) The differential equation relating the input and output of a causal LTI system is given by

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

Determine the impulse response and hence the frequency response of the system. Use Laplace transform technique.

(OR)

13b) i) Write the state variable formation of the network given below.



ii) The impulse response of a causal LTI system is given by $e^{-2t}u(t)$. This system is excited by an input of $5e^{-t}u(t)$. Find the output of the system

(6+10)

14a) i) Find the DTFT of the sequence given by

$x[n] = a^n u[n], \quad |a| < 1$

ii) Write briefly about the spectrum of sampled signals

(8+8)

(OR)

14b)i) Find the inverse Z transform of the following

$$X(z) = \frac{1 - \frac{1}{2}z^{-1}}{1 + \frac{1}{4}z^{-1} + \frac{1}{8}z^{-2}}, \quad |z| > \frac{1}{2}$$

ii) Prove any two properties of DFT

(8+8)

15a) Generate the state variable description of a DT system represented by

$y[n] + 2\,y[n-1] + y[n-2] = x[n]$.

Also draw the block diagram representation of the system

(10+6)

(OR)

15b) i) Find the frequency response of the system given by the difference equation

$y[n] - 0.5\,y[n-1] + 0.25\,y[n-2] = x[n]$.

ii) Write about the ROCs of Z transforms of right sided finite length sequence and left sided finite length sequence

(10+6)