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B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006

Fourth Semester

Electronics and Communication Engineering

(Common to BE (Part-Time) Third Semester R 2005)

EC 1252 – SIGNALS AND SYSTEMS

Electronics and Communication Engineering

EC 220

Time: Three hours Maximum: 100 marks

Answer ALL questions

PART A – (10 × 2 = 20 marks)

1. Verify whether $x(t) = Ae^{-\alpha t} u(t), \alpha > 0$ is an energy signal or not.
2. Show that the complex exponential signal $x(t) = e^{jw_0 t}$ is periodic and that the fundamental period is $2\pi/w_0$.
3. State any two properties of Discrete-time systems.
4. Find the Laplace transform of an unit step function.
5. What is alaising?
6. State any two properties of the region of convergence for the z-transform.
7. State the lineatity and periodicity properties of discrete time fourier transform.
8. Write the condition for the LTI system be causal and stable.
9. Realize the following system
$y(n) = 2y(n-1) - x(n) + 2x(n-1)$
in Direct form I method.
10. Draw the general block diagrams of the parallel and cascade form structure.

PART B – (5 × 16 = 80 marks)

11. (a) (i) Explain the classification of continuous time signals. (10)

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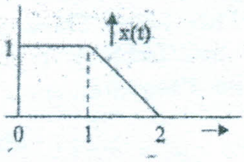
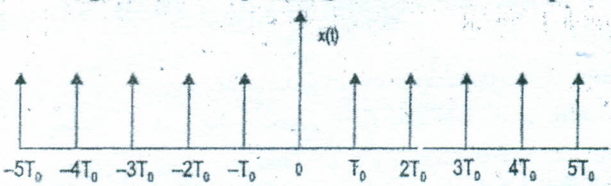
(ii) Consider the signal $x(t)$ shown in figure. Plot $x(t+1)$ and $x\left(\frac{3}{2}t\right)$. (6)



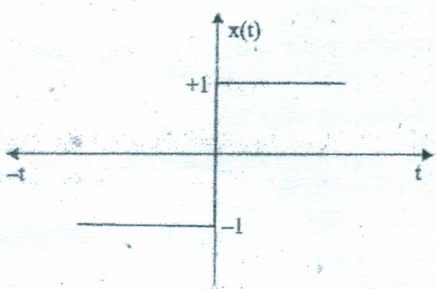
(or)

(b) (i) Find out the exponential fourier series for the impulse main shown in figu... Also plot the magnitude and phase spectrum. (8)



11. (b) (ii) State and explain any four properties of fourier series. (8)

12. (a) (i) Find the fourier transform of the signum function shown in figure. (4)



(ii) Prove the slating property of fourier transform and hence and find the fourier transform of $f(t) = e^{-0.5t} . u(t)$ (6)

(iii) With an example show how impulse response and transfer function of a system can be obtained using Laplace transform. (6)

(or)

12. (b) (i) State and prove Parsevals relation. (7)

(ii) Check whether the following systems are stable and causal:

(1) $h(t) = e^{-2t} u(t-1)$

(2) $h(t) = e^{-4t} u(t+10)$

(3) $h(t) = te^{-1} u(t)$ (9)

13. (a) State the prove the sampling theorem. Also explain how reconstruction of original signal is done from the sampled signal. (8 + 8)

(or)

13. (b) (i) State and prove Initial value theorem

(ii) Determine the Z-transform of the signal $x(n) = na^n u(n)$ and hence determine z-transform of the unit ramp signal $v(n)$

14. (a) (i) Convolve the following two sequences linearly $x(n)$ and $h(n)$ to get $y(n)$. $x(n) = \{1, 1, 1\}$ and $h(n) = \{2, 2\}$. Also give the illustration. (10)

(ii) Explain the properties of convolution. (6)

(or)

(b) (i) Explain the properties of an LTI system.

14. (b) (ii) Determine the range values of the parameter 'a' for which the linear Time Invariant system with impulse response $h(n)$ is stable.

$h(n) = a^n, n \geq 0$ and n even

$= 0$, otherwise [illegible]

15. (a) (i) Give the summary of elementary blocks used to represent discrete time systems.

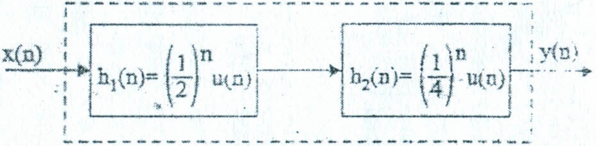
15. (a) (ii) A difference equation of a discrete time system is given below:

$$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + \frac{1}{2}x(n-1)$$

Draw direct form – I and direct form – II structures. (6)

(or)

15. (b) Two discrete time LTI systems are connected in cascade as shown in the figure. Determine the unit sample response of this cascade connection. Unit sample response of overall system = $h(n)$.



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