B.E. Electronics & Telecommunication / Communication Engineering / Electronics Engineering / Electrical (Electronics & Power) Engineering Fifth Semester

ET502 / EN502 / EP503 - Signals and Systems

P. Pages : 2 **GUG/W/18/1618**

Time : Three Hours * 1 2 7 2 * Max. Marks : 80

Notes : 1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Diagrams and Chemical equation should be given wherever necessary.
5. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Explain what do you understand by symmetric signals and antisymmetric signals (Examples must be given for symmetric and antisymmetric signals). **8**

b) Find even and odd part of the signal **8**

$$x(n) = \left\{1,\ 2,\ \underset{\uparrow}{3},\ 2,\ 1,\ -1\right\}$$

OR

2. a) Find the Fourier transform of - **8**

i) $x(t) = u(t)$

ii) $x(t) = \sin(t)$

b) Explain with an example what do you understand by - **8**

i) Linear and nonlinear system

ii) Causal and non causal system

iii) Stable and astable system

3. a) Write properties of L.T.I. systems. **8**

b) Find linear convolution of the signals $x_1(n) = \{2, 1, 2, 1\}$ and $x_2(n) = \{1, 2, 3, 4\}$. **8**

OR

4. a) Determine the output y(n) of a relaxed linear time-invariant system with impulse response. **8**
$h(n) = a^n u(n), |a| < 1$ when input is a unit step sequence that is x(n) = u(n).

b) Determine the particular solution of the difference equation **8**

$$y(n) = \frac{5}{6}y(n-1) - \frac{1}{6}y(n-2) + x(n)$$

5. a) Obtain Fourier series representation for the signal shown in fig. Q. 5 (a). **8**

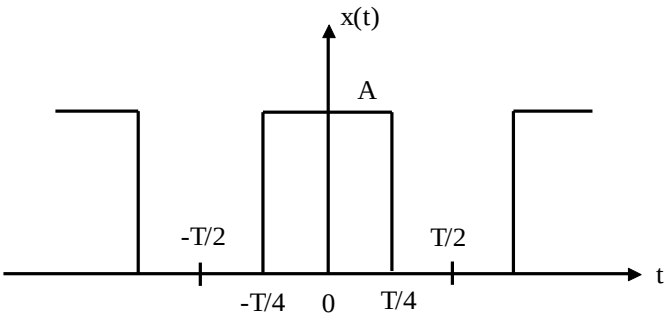

Fig. Q. 5 a

b) Compute the Fourier transform of the following signals : **8**

i) $x(n) = u(n) - u(n - 6)$ ii) $x(n) = \left(\frac{1}{4}\right)^n u(n+4)$

OR

6. Obtain circular convolution of $x_1(n) = \{2, 1, 2, 1\}$ and $x_2(n) = \{1, 2, 3, 4\}$ using DFT and IDFT Technique. **16**

7. a) Write mathematical expression for z - transform and explain with an example what do you understand by Region of convergence (R.o.C.) of z-transform. Also write its properties. **8**

b) Determine the z-transform of the signal $x(n) = -n\,a^n\,u(-n-1)$. **8**

OR

8. a) Determine the causal signal x(n) if its z-transform is given by - **8**

i) $X(z) = \frac{1+3z^{-1}}{1+3z^{-1}+2z^{-2}}$ ii) $X(z) = \frac{1}{1-z^{-1}+\frac{1}{2}z^{-2}}$

b) Obtain the solution of difference equation **8**

$y(n) = \frac{1}{2}y(n-1) + 2x(n)$ with initial conditions y(0) = 1 and y(1) = 1.

9. Determine the impulse response and step response of the causal system **16**

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

OR

10. a) State and prove sampling theorem. **8**

b) A continuous time signal is given by $x(t) = 8\cos 200\pi t$ **8**

Determine :

i) Minimum sampling rate i.e. Nyquist rate required to avoid aliasing.

ii) If sampling frequency f_s = 400 Hz. What the discrete time signal x(n) obtained after sampling.

iii) If sampling frequency f_s = 150 Hz. What is the discrete time signal x(n) obtained after sampling.

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