

B.E. Seventh Semester (Computer Engineering) (CGS)
10281 : Signals and Systems : 7 KE 01

P. Pages : 3

Time : Three Hours



AU - 2898

Max. Marks : 80

- Notes :
1. Due credit will be given to neatness and adequate dimensions.
 2. Retain the construction lines.
 3. Illustrate your answer necessary with the help of neat sketches.

SECTION - A

1. a) Determine whether the following signals are periodic or aperiodic. 6

i) $x(n) = u(n) + u(-n)$

ii) $x(n) = 3e^{j3/5\left(\pi + \frac{1}{2}\right)}$

iii) $x(n) = \sin\left(\frac{6\pi n}{7} + 1\right)$

- b) A discrete time sequence is given below 8

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

i) Sketch $x(n)$

ii) Determine $x(n)u(2-n)$

iii) Sketch $x(n-1)\delta(n-3)$

iv) Find out $x(-n-3)$

OR

2. a) Compare energy and power signals. 5

- b) If $x(n) = \left\{ 1, 2, 3, \underset{\uparrow}{4}, 4, 3, 2, 1 \right\}$ 9

sketch

i) $x(n)$

ii) $x(-n-3)$

iii) $x(n)\delta(n)$

iv) $x(-n-1)$

3. a) Determine zero input response of the system described by second order difference equation 8

$$y(n) - \frac{5}{6}y(n-1) + \frac{1}{6}y(n-2) = 0 \text{ where } y(-1) = y(-2) = 1$$

- b) What is LTI system? Explain in brief properties of LTI system. 5

OR

4. a) Determine the following system for linearity causality and stability 6

i) $y(n) = x(n) - x(n-1)$

ii) $y(n) = n \cos(x(n))$

- b) Determine the response of the system with impulse response $h(n) = a^n u(0)$ to the i/p signal $x(n) = u(n) - u(n-10)$. 7

5. a) Explain the following properties of continuous time Fourier series. 6
 i) Linearity ii) Time shifting
 iii) Time reversal iv) Time scaling

- b) Determine the complex exponential Fourier series for each of following 7
 i) $x(t) = \cos \omega_0 t$
 ii) $\sin \omega_0 t$

OR

6. a) Explain the properties of discrete time Fourier series in detail. 8
 b) Explain the Parseval's relation for continuous time periodic signals. 5

SECTION – B

7. a) Determine the Fourier transforms of the following signal. 9
 i) $x(t) = e^{-at} u(t)$ $a > 0$
 ii) $v(t) = u(t)$

- b) Explain the time & frequency scaling properties of continuous time Fourier transform. 5

OR

8. a) Explain convolution property and multiplication property with example. 6

- b) Find the impulse response of the system with frequency response 8

$$H(j\omega) = \frac{(\sin^2(3\omega)) \cos \omega}{\omega^2}$$

9. a) Describe the method of reconstruction of signals from its sample using Interpolation. 5

- b) Determine the Nyquist sampling frequency & Nyquist interval for following signals. 8

i) $5 \cos 1000 \pi t \cos 6000 \pi t$

ii) $\frac{\sin 1200 \pi t}{\pi t}$

iii) $\left(\frac{\sin 100 \pi t}{\pi t} \right)^2$

OR

10. a) Explain the following in brief 4

i) Digital differentiator

ii) Half sample delay

- b) Find the Nyquist rate for each of the following signals. 9
- i) $x(t) + x(t-1)$
- ii) $\frac{\sin(4000\pi t)}{\pi t}$
- iii) $\left(\frac{\sin(100\pi t)}{\pi t}\right)^2$

11. a) Explain time shifting and convolution properties of z-transform. 5
- b) Determine $x(n)$ for $x(z) = \frac{5z^{-1}}{(1-2z^{-1})(3-z^{-1})}$ 8

OR

12. a) Compute the response of the system 8
 $y(n] = 0.7 y(n-1) - 0.12 y(n-2) + x(n-1) + x(n-2)$
when $x(n) = nu(n)$
- b) Define region of convergence. State its properties. Draw the ROC for different discrete time signal. 5

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