

Roll No: -----



**UNIVERSITY OF PETROLEUM
AND ENERGY STUDIES**

End Semester Examination – Dec, 2017

Program/course: B. Tech EE
Subject: SIGNALS & SYSTEMS
Code : ELEG 201
No. of page/s: 3

Semester – III
Max. Marks : 100
Duration : 3 Hrs

Section-A

Answer all the questions

5X4=20

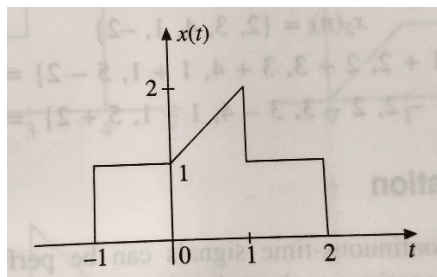
1. Distinguish Fourier transform and discrete Fourier transform .
2. Determine the power and rms value of the signal $x(t)=7 \cos(20t+\pi/2)$.
3. Which of the signals are causal:
 - (a) $x(t) = e^{2t}u(t- 1)$
 - (b) $y(t) = u[t+2] - u[t-2]$
4. Find even and odd components of the signals:
 - (i) $x(t) = e^{j2t}$
 - (ii) $x(t) = 1+2t +3t^2$
5. Find period of the signal $x(t) = 3\cos 6t+2\sin \pi t$.

Section-B

Answer all the questions

5X8=40

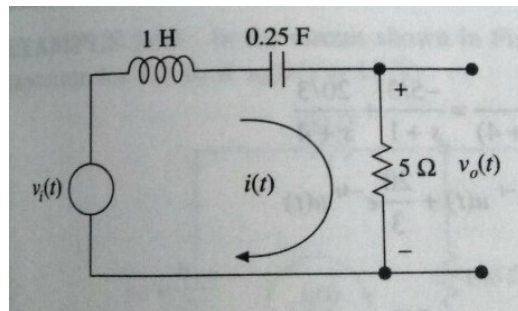
6. For the signal $x(t)$ shown in the figure determine the following
 - (i) $x(t - 3)$ and $x(t + 3)$
 - (ii) $x(2t + 2)$ and $x(1/2t - 2)$
 - (iii) $x(-t + 2)$ and $x(-t - 2)$



7. Check whether the system defined by the equation $\frac{dy(t)}{dt} + 5y(t) = x(t) \frac{dx(t)}{dt}$ is
 (a) Static or dynamic (b) linear or non-linear (c) Causal or non Causal [8]
8. Find the Fourier Transform of (i) $x(t) = e^{-3t} u(t-2)$ (ii) $x(t) = \cos \omega t u(t)$ [5+3]
9. Find the initial value and final value of the function

$$X(s) = \frac{(s+5)}{(s^2 - 3s + 2)}$$

10. Find the impulse response of the circuit shown below.



[8]

Section-C

Answer any two questions

2X20=40

11. (a) A causal LTI system is described by the difference equation

$$y(n] = -9y(n-1) + \frac{1}{2}y(n-2) = x(n] - 3x(n-1)$$

Find the system function and frequency response of the system. Plot the poles and zeroes and indicate the ROC. Determine the stability and impulse response of the system.

(b) Using the properties of Fourier transform, determine find the inverse Fourier transform of the signal

$$X(j\omega) = \frac{1+3(j\omega)}{(j\omega+3)^2}$$

[16+4]

12. (a) Determine the Z.T and ROC of the causal sequence $x[n] = \{1, 2, -2, -4, 1\}$

(b) Determine Z.T and ROC $(2/3)^n u[n] + (-1/2)^n u[n]$.

↑

(c) Using Z.T find convolution of two sequences

$$X_1[n] = \{1, 1, 0, -1, 0, 3\} \& X_2[n] = \{1, 1, -1\}$$

[6+6+8]

13. (a) Evaluate the impulse response of an LTI system described by differential equation

differential equation $\frac{d^2 y(t)}{dt^2} - \frac{dy(t)}{dt} - 2y(t) = x(t)$.

(b) A causal system is represented by $H(z) = \frac{z+2}{z^2-3z+4}$

(c) Determine D.T.F.T of the signal

(i) $x[n] = \{1, -1, 2, 2\}$

(ii) $x[n] = 2^n u[n]$

[8+8+4]



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Section-A

Answer all the questions

5X4=20

1. Find whether the following signals are even or odd or neither

(i) $x(t) = e^{-3t}$ (ii) $x(t) = \sin t + \cos t$.

[4].

2. Find whether the following signal are even or odd

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

3. Find whether the signal is energy or power signal.

$x(t) = u(t) - u(t-1)$

[4]

4. What is Z Transform and its ROC.

[4]

5. Find whether the signal is periodic or not and if periodic, find the period.

(i) $x(t) = \sin 12\pi t$ (ii) $x(t) = 3\cos 6t + 2\sin 7t$.

[4]

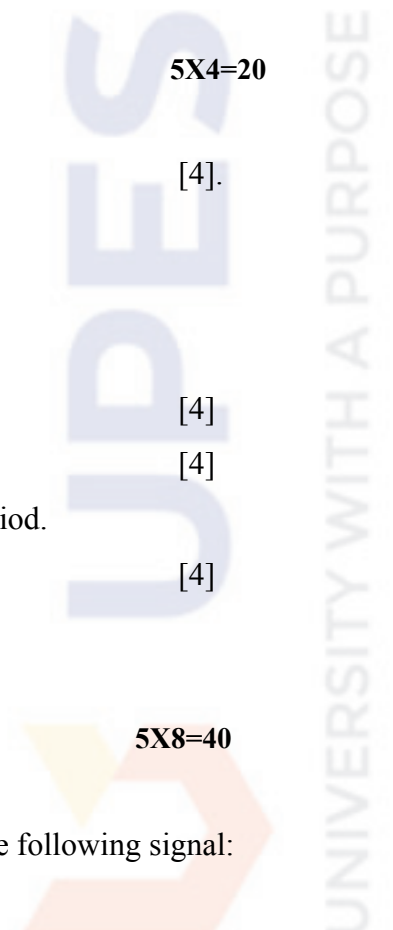
Section-B

Answer all the questions

5X8=40

6. If the signals $x(t)$ is given in the fig. (a). shown below. Determine the following signal:

(i) $x(-3t-2)$ (ii) $x(1/2t+2)$. (iii) $2x(-t+2)$ and $x(-t-2)$



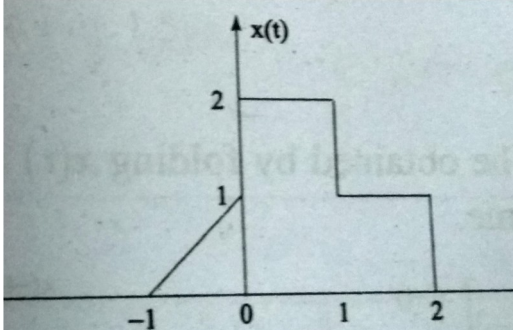


Fig (a)

[8]

7. Find the Fourier Transform of (i) $x(t) = e^{-3t} u(t-3)$ (ii) $x(t) = t \cos \omega t u(t)$ [4+4]

8. (a) Find the inverse Laplace transform of the function

$$X(s) = \frac{(s+5)}{(s^2+3s+2)} \quad \text{(b) Find Laplace transform of}$$

$$x(t) = \sin^2 3t u(t)$$

[4+4]

9. Determine D.T.F.T of the signal (i) $x[n] = \{1, -2, 1, 2, 1\}$

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

(b) Establish the Relation between S-plane and Z-plane.

[6+2]

10. Determine the impulse response of an LTI system described by differential equation differential equation $\frac{d^2 y(t)}{dt^2} - \frac{dy(t)}{dt} - 2y(t) = x(t)$.

[8]

Section-C

Answer any two questions

2X20=40

11. (a) A causal LTI system is described by the difference equation

$$y(n) = y(n-1) + y(n-2) + x(n) + 2x(n-1)$$

Determine the system function and frequency response of the system. Plot the poles and zeroes and indicate the ROC. Determine the stability and impulse response of the system.

(b) Using the properties of Fourier transform, find the Fourier transform of the signal

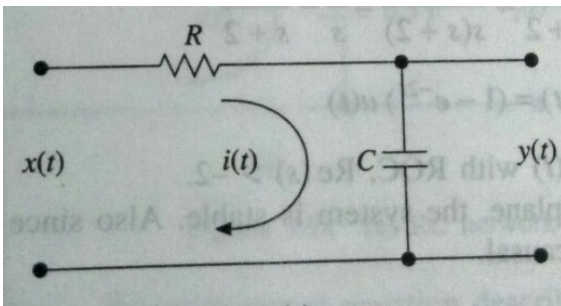
$$x(t) = te^{-2t}u(t). \quad [16+4]$$

12. (a) Let $X(s)$ and $Y(s)$ denote the Laplace transform of $x(t)$ and $y(t)$, respectively and let $H(s)$ denote the Laplace transform of $h(t)$, the system impulse response.

Determine $H(s)$ as a ratio of two polynomials in s . Sketch the Pole zero pattern of $H(s)$. Determine $h(t)$ for each of the following cases.

- (i) The system is BIBO stable
- (ii) The system is causal
- (iii) The system is neither stable nor causal.

(b) Evaluate the impulse response of the circuit shown below.



[12+8]

13. (a) Determine the Z.T and ROC of the anti causal sequence $x[n] = \{3, 2, -1, -4, 1\}$

(b) Determine Z.T and ROC of $x[n] = (3/4)^n u[n] + (-5/2)^n u[-n]$.

(c) Using Z.T find convolution of two sequences

$$x_1[n] = \{1, 2, -1, 1, 3\} \text{ \& } x_2[n] = \{1, 4, -1\}$$

[6+6+8]

