

- NB:** (1) Question no. 1 is compulsory
 (2) Attempt any three questions of the remaining questions
 (3) Assume suitable data where ever necessary

Q1 Attempt the following questions 20

a) Find the z transform and draw the ROC of

$$x[n] = 0.5^n u(n) + 0.8^n u(-n-1)$$

b) Find the initial value of

$$X(s) = \frac{2s + 5s + 12}{s^3 + 4s^2 + 14s + 20}$$

c) Plot the single sided spectrum of the given signal

$$x(t) = 20 \cos(100\pi t + 20^\circ) + 6\sin(50\pi t)$$

d) Determine whether the following signals are periodic or not. If periodic , find the time period

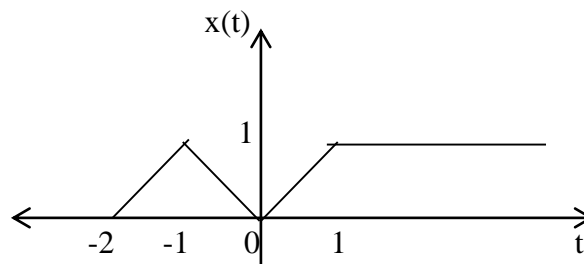
i. $x(t) = 3 \cos\left(4t + \frac{\pi}{3}\right)$

ii. $x[n] = 2 \cos\left(\frac{\pi}{4}n\right) + \sin\left(\frac{\pi}{8}n\right) - 20 \cos\left(\frac{\pi}{4}n + \frac{\pi}{6}\right)$

Q2 a) Find the convolution sum (Mathematically) 12

$$x[n] = \{3, 2, 1, 0, 1, 2, 3\} \quad h[n] = \{2, 1, 0, 1, 2, \}$$

b) Find even and odd parts 08



Q3 a) Determine whether the given signals are power/ energy signals 05

i. $x(t) = \cos(t)$

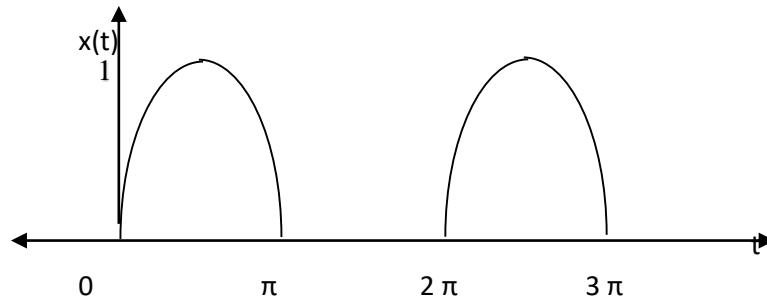
b) $x[n] = \{1, 0, 2, 0, -1\}$, $h[n] = \{2, 0, 2\}$, compute the following 05

i. $x[n] h[n]$

ii. $x[n] h[n+2]$

- c) Find $y(t)$, if $y(t) = x(t) h(t)$; $x(t) = e^{2t}u(t)$, $h(t) = u(t-3)$ 06
 d) Find DTFT of $x[n] = a^n u[n]$ 04

- Q4 a) Find the Quadrature Fourier series of the following signal and sketch the spectrum 10



- Q5 a) Given $x[n] \longleftrightarrow z^2/(z^2-16)$ 10
 Using the properties of z-transform determine the following
 $x_1[n] = x[n] * x[-n]$ $x_2[n] = 2^n x[n]$

- Q5 a) Find the Laplace transform of the signal and their ROC 10
 $x(t) = e^t u(-t) + e^{-3t} u(t)$
 $x_2(t) = e^t \sin(400\pi t)u(t)$

- b) Find IZT , 10

$$X[z] = \frac{1 - \frac{1}{3}z^{-1}}{(1 - z^{-1})(1 + 2z^{-1})}; ROC |z| > 2$$

- Q6 a) Prove the time shifting property of Laplace Transform 05
 b) Determine whether the given system is causal/ non causal, Static/ Dynamic, Variant/ Invariant 10
 i. $y(t) = x(t-2) + x(2-t)$
 ii. $y[n] = \cos(n\pi x[n])$

- c) Prove the differentiation property of Z transform 05
