

# Question Bank

## Signal and System (IEC-402)

**Q.1** Define signal. Give some examples of signals.

**Q.2** What is Signal modeling?

**Q.3** Give frequency ranges of some natural signals such as biological, seismic and electro magnetic signals.

**Q.4** Give classification of signals.

**Q.5** Discuss dependent and independent variables of a signal.

**Q.6** Discuss the following:

- (a) Deterministic and random signals?
- (b) Piece wise-defined and simply-defined signals
- (c) periodic and non-periodic signals
- (d) Power and energy signals
- (e) Even and odd signals.

**Q.7** Write short notes on the following:

- (a) Exponential functions or signals
- (b) Sinusoidal signals

**Q.8** what are singularity functions?

**Q.9** What is unit step function? How can it be obtained from a unit-step function?

**Q.10** Define linearity property of a system with examples.

**Q.11** Define time-invariance property of a system with examples.

**Q.12** What is LTI system? Give example.

**Q.13** Discuss the following systems

- (a) Continuous-time LTI system

(b) Discrete-time LTI system

**Q.14** what is impulse response?

**Q.15** What is physical significance of impulse of a system.

**Q.16** What do you mean by Fourier analysis? What is Fourier transform?

**Q.17** Distinguish Fourier transform from Fourier series.

**Q.18** Calculate Fourier transform of following functions.

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

(b)  $e^{-2|t-1|}$

(c)  $\delta(t+1) + \delta(t-1)$

(d)  $d/dt\{u(-2-t)+u(t-2)\}$

**Q.19** Compute the Fourier transform (CTFT) of each of the following signals.

(a)  $[e^{-at}\cos\omega_0 t] u(t), a>0$

(b)  $[e^{-3|t|}\sin 2t]$

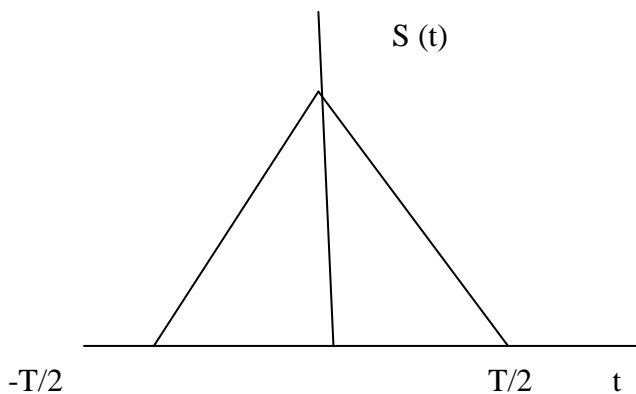
(c)  $S(t) = 1 + \cos\pi t, |t| \leq 1$

$0, |t| > 1$

(d)  $S(t) = 1 - t^2, 0 < t < 1$

$0, \text{ otherwise}$

**Q.20** Find the CTFT of the triangular pulse shown in figure below.



**Q.21** Discuss the magnitude –phase representation of the frequency response of continuous time and discrete-time LTI systems.

**Q.22** Define linear and non-linear phases of LTI systems.

**Q.23** Find the transfer function of the continuous-time LTI system for which the following information is given.

- (a) The system is causal
- (b) The system function is rational and has two poles at  $s=-2$  and  $s=4$
- (c) If  $s(t)=1$ , then  $y(t)=0$ ,
- (d) The impulse response  $h(t)=4$  at  $t=0$

**Q.24** Distinguish z-transform from Laplace transform.

**Q.25** What do you mean by region of convergence for the z-transform?

**Q.26** Discuss the following types of z-transform?

- (a) Bilateral or two-sided z-transform
- (b) Unilateral or one-sided z-transform

**Q.27** What are various configurations of ROCs for the z-transform?

**Q.28** What is inverse z-transform?

**Q.29** State and explain the following:

- (a) Casuality of discrete-time LTI systems
- (b) Stability of discrete-time LTI systems

**Q.30** Find the z-transforms of the discrete-time signals  $(n) = -A^n u(-n-1)$ . Also sketch its ROC.

**Q.31** Determine  $S(n)$  if  $S(z) = z^{-3}/(1 - (1/4)z^{-1})$

**Q.32** By using long division method, determine the inverse z-transform of

$$S(z) = z/(3z^2 - 4z + 1)$$

**Q.33** Determine z-transform of a discrete-time signal

a.  $S(z) = A^n u(n)$

b.  $S(z) = A^{n+1} u(n+1)$