B.E. Computer Science & Engineering (Model Curriculum) Semester-V
TEE101CS - Signals and System

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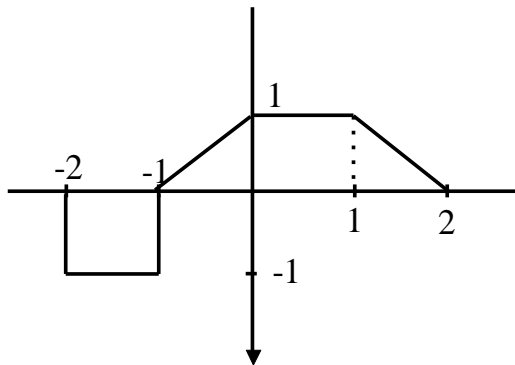
Notes : 1. All questions carry equal marks.
2. Assume suitable data wherever necessary.
3. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Define even and odd signal and find even and odd parts of $x(n) = u(n) - u(n-5)$. **8**

b) Sketch the following signal **8**

i) x(-t)
ii) x(2-t)
iii) x(3t)
iv) 2x(t-1)

OR

2. a) Define the following signal with examples. **8**
i) Linear and Non-Linear system   ii) Time Varient and Invarient system

b) Define Energy power signal and find whether the following signal is Energy signal or power signal. **8**

i) $x[n] = 4\left(\dfrac{1}{2}\right)^{n} \cdot u[n]$

3. a) Explain the following properties of convolution **8**
i) Associative property.   ii) Commutative property
iii) Distributive property   iv) Property based on linearity

b) Find discrete time convolution of **8**
   $x[n] = \mu[n]$
   $h[n] = \mu[n]$
   $y[n] = ?$

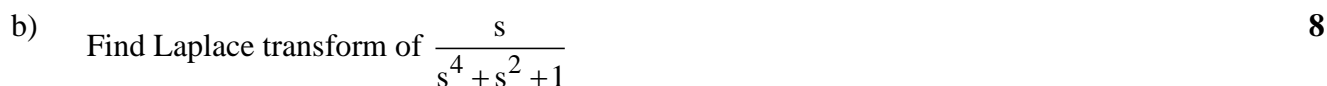**OR**

4. a) Find convolution using graphical method. **8**
   $x(n) = \{\underset{\uparrow}{1}, 1, -1\}$

   $h(n) = \{\underset{\uparrow}{1}, 2, 3\}$

b) Explain the convolution property based on time invariancy and y[n] if **8**

$$x[n] = (0.5)^n \cdot \mu[n]$$
$$h[n] = \delta[n+2] + 0.5\delta[n+1]$$

5. a) Find the trigonometric Fourier series expansion of the half wave rectifier sine wave shown **8**
in the fig.

b) Find Laplace transform of $\dfrac{s}{s^4 + s^2 + 1}$ **8**

OR

6. a) Prove the following properties of exponential Fourier series. **8**
   i) Time Reversal   ii) Time Differentiation

b) Explain the following property of z-transform. **8**
   i) Multiplication property   ii) Co-relation property

7. a) $X(t) = \dfrac{1}{1 - az^{-1}}$; $|z| < a$ find inverse z-transform using long division method. **8**

b) Find Laplace transform of $e^{-3t}(2\cos 5t - 3\sin 5t)$ **8**

OR

8. a) Find z-transform of **8**
$$x(n) = \{\underset{\uparrow}{2}, -1, 3, 2, 0, 1\}$$

   and also find ROC.

b) If $Lf(t) = \bar{f}(s)$, show that $L\left[(\cos hat)\, f(t)\right] = \dfrac{1}{2}\left[\bar{f}(s-a) + \bar{f}(s+a)\right]$ Hence evaluate, **8**

   $\cos h3t \cdot \cos 2t$

9. a) Find the Nyquist rate and Nyquist interval for the signal **8**
$$x(t) = \dfrac{1}{2\pi} \cos(4000\pi t) \cdot \cos(1000\pi t)$$

b) Explain flat to sampling in detail. **8**

OR

10. a) Define sampling and Nyquist rate & calculate the Nyquist rate in rad/sec and in Hz of the **8**
signal given below $m(t) = 2\sin 4\pi t \cdot \cos 2\pi t$.

b) A continuous signal $x(t) = 5\cos 200\pi t$ is sampled with the sampling frequency of 300Hz. **8**
   i) Find Nyquist rate and Nyquist interval
   ii) Find the period of resultant discrete signal

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