Term Evaluation (Odd) Semester Examination September 2025

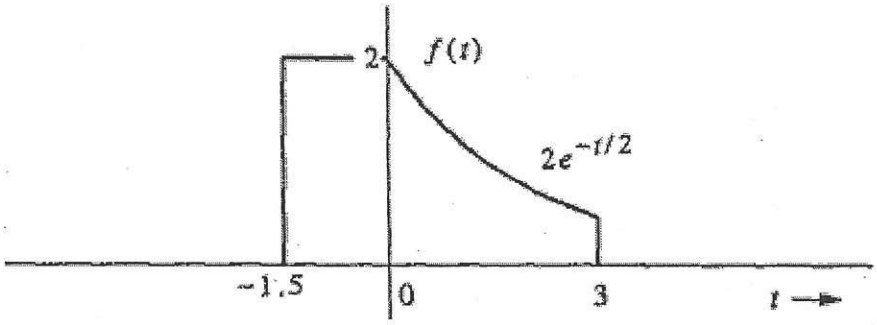
Roll no.....

Name of the Course: B.Tech
Semester: III
Name of the Paper: **Signal and Systems**
Paper Code: **TEC 304**
Time: 1.5 hour **Maximum Marks: 50**

Note:
(i) Answer all the questions by choosing any one of the sub-questions
(ii) Each question carries 10 marks.

Q1. **CO1** (10 Marks)

(a) Figure shows a signal f(t). Sketch and describe mathematically this signal time compressed by a factor 3. Repeat the problem for the same signal time expanded by factor 2.



OR

(b). Determine whether the following signals are energy signals, power signals, or neither

i) $x(t) = e^{-at}u(t); a > 0$
ii) $x(t) = tu(t)$
iii) $x(t) = u(t)$

Q2. **CO1** (10 Marks)

(a). Show that

$$t \times \delta'(t) = -\delta(t)$$

OR

(b). Explain the following:
(i) Analog and Digital signals
(ii) Deterministic and random signals
(iii) Causal, Anti-Causal and non-Causal signals.

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Q3. **CO1/CO2**(10 Marks)

(a). Determine whether or not each of the following signals is periodic. If a signal is periodic, determine its fundamental period.

(i) $x[n]=\cos\left(\frac{\pi}{3}n\right)+\sin\left(\frac{\pi}{4}n\right)$ (ii) $x[n]=e^{\frac{j\pi n}{4}}$ (iii) $x(t)=\cos\left(\frac{\pi t}{3}\right)+\sin(\frac{\pi t}{4})$

OR

(b). For each of the following systems, find out if they are causal and/or stable:

(i) $y[n]=x[-n]$, (ii) $y(t)=e^{x(t)}$

Q4. **CO2** (10 Marks)

a. Compute $y[n]=x[n]*h[n]$, where $x[n]=\alpha^n u[n]$, $h[n]=\beta^n u[n]$.

OR

b. Check whether the given system $y(t) = x(t)\cos(\omega_c t)$

(i) Linear or nonlinear

(ii) Time invariant or time variant.

(iii) Causal and non-Causal.

Q5. **CO2** (10 Marks)

a. Determine whether or not each of the following systems is invertible. If the System is invertible, give the inverse system.

(a) $y(t)=x^2(t)$

(b) $y[n]=x[n]\times x[n-2]$

OR

b. Verify the associative property, that is,

$$\{x[n]*h_1[n]\}*h_2[n]=x[n]*\{h_1[n]*h_2[n]\}$$