1 sthalf-09-nkE 149   TE(ETRX) Sem V (R)   01/06/09
Continuous Time Signals & Systems 3-6 p.m.
Con. 3554-09.   VR-5103

(REVISED COURSE)

(3 Hours)   [Total Marks : 100

N.B.: (1) Question No. **1** is **compulsory**.
    (2) Answer any **four** out of remaining **six** questions.
    (3) **Figures** to the **right** indicate marks.

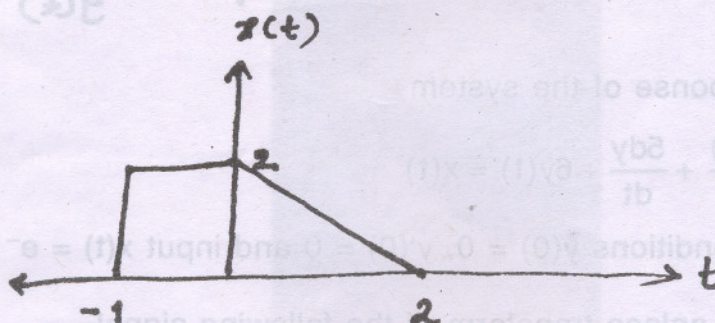1. Solve any **four** :—   20
    (a) Define impulse signal, step signal, ramp signal.
    (b) Find whether the following signal is energy or power signal.
$$x(t) = A. e^{-at} u(t), \ a > 0.$$
    (c) Find whether the following signal is periodic or aperiod. If it is periodic, find its fundamental period.
$$x(t) = \cos(2t) - \cos(2t - \pi/4)$$
    (d) Differentiate between linear and non linear system.
    (e) Evaluate $\displaystyle\int_{-8}^{8} \delta(-t-2)\, dt$

2. (a) x(t) signal is shown below :—   10

    Sketch and label the following signals
      (i) $y(t) = x(-t)$ (ii) $y(t) = x(t/2)$ (iii) $y(t) = x(-t-2)$
      (iv) $y(t) = x(t+2)$ (v) $y(t) = 2x(t)$
    (b) Plot the following signal.   10
      (i) $x(t) = u(t) + r(t-1) - 2u(t-3)$
      (ii) $x(t) = 2[u(t) + u(-t) - u(t-2) - u(-t-2)]$

3. (a) State initial and final value theorem of Laplace transform.   10
    Also find initial and final value of
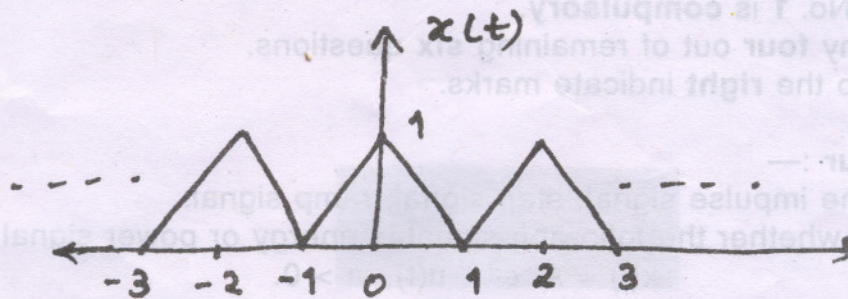$$X(s) = \frac{s+10}{s^2+3s+2}$$

    (b) Obtain the inverse Laplace transform of   10
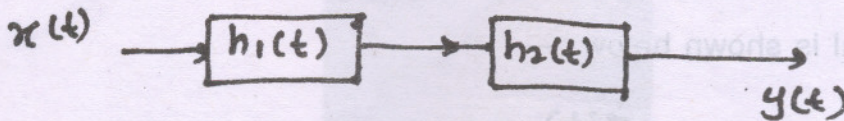$$X(s) = \frac{3s+7}{s^2-2s-3}$$
    for all possible region of convergence.

4. (a) Find exponential fourier series expansion for the signal shown below :   **10**

    (b) Find the Fourier transform of signum function.   **10**

5. (a) System shown below is formed by connecting two systems in cascade. The   **10**
      impulse responses of two systems are $h_1(t) = e^{-2t} u(t)$ and $h_2(t) = 2e^{-t} u(t)$
      Find impulse response h(t) of overall system.

    (b) Find the response of the system   **10**

$$\frac{d^2 y(t)}{dt^2} + \frac{5dy}{dt} + 6y(t) = x(t)$$

      with initial conditions $y(0) = 0$, $y'(0) = 0$ and input $x(t) = e^{-t} u(t)$.

6. (a) (i) Find the Laplace transform of the following signal—   **12**
               $x(t) = t\, e^{-at}\, u(-t)$
      (ii) Derive the relation between Fourier transform and Laplace transform.
    (b) State and prove sampling theorem.   **8**

7. Write short notes on the following :—   **20**
      (a) Parseval's theorem
      (b) Gibb's phenomenon
      (c) Convolution theorem
      (d) Differentiation property of Laplace transform.