COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Government of Maharashtra.)
SHIVAJI NAGAR, PUNE - 411 005

END Semester Examination

(ET-205) Signals and Systems

Course: B.Tech — Branch: Electronics and TeleCommunication Engineering

Semester: Sem III

Year: 2014-2015 — Max.Marks:60

Duration: 3 Hours — Time:- 10.00 to 1.00 pm. — Date: 28 NOV 2014

Instructions: — MIS No. | | | | | | | | | | |

1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of anything like stationery, calculator is not allowed.
5. Assume suitable data if necessary.
6. Write your MIS Number on Question Paper

Q. 1 A The trapezoidal pulse x(t) shown in Fig. 1 is applied to a differentiator defined by $y(t) = \frac{dx(t)}{dt}$. (i)Determine resulting output y(t) of the differentiator **(5)**

(ii) Determine total energy of x(t).

(iii) The pulse shown in Fig. 1 is time scaled by y = x (at). Sketch y (t) if a=0.2.

$$x(t) = \begin{cases} 5-t & 4 \le t \le 5 \\ 1 & -4 \le t \le 4 \\ t+5 & -5 \le t \le -4 \\ 0 & \text{otherwise} \end{cases}$$

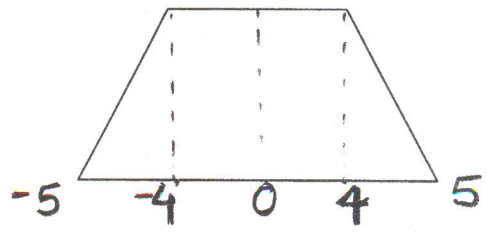
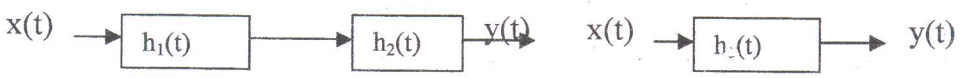


Fig. 1

B The system is formed by cascading of two systems. The impulse response of the system is given by $h_1(t) = e^{-2t}u(t)$ and $h_2(t) = 2e^{-t}u(t)$ **(5)**

Find impulse response h(t) of overall system.



C Find Fourier Transform of the signal $x(t) = \begin{cases} e^{-at} & t > 0 \\ e^{at} & t < 0 \end{cases}$ **(3)**

Sketch X(w)

D Find Fourier Transform of $x(t) = (cosw_0 t)$. Plot the spectrum. **(2)**

Q. 2 **A** Convert following differential equation into integral and draw Direct Form-I and Direct form-II. **(5)**

$$\frac{d^3}{dt^3}y(t)+2\frac{d}{dt}y(t)+3y(t)=x(t)+3\frac{d}{dt}x(t)$$

B Consider a causal discrete time FIR filter described by the impulse response **(5)**

h(n)={ 2 2 -2 -2}

a)Sketch the impulse response h(n) of the filter.

b)Find the frequency response of the filter $H(e^{jw})$

c) Sketch the magnitude response $|H(e^{jw})|$

C Consider a continuous time LTI system whose step response is given by $s(t) = e^{-t}u(t)$. Determine & sketch the output of the system to the input x(t) shown in Fig 2. **(3)**

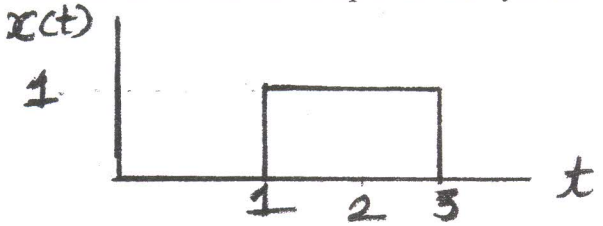


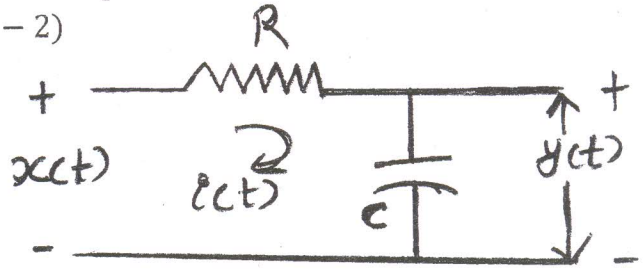
Fig 2.

D Evaluate the continuous time convolution integrates for **(2)**

$$y(t) = (u(t) - u(t-2)) * u(t)$$

Q 3 **A** Find the response of the circuit to the input **(5)**

$x(t) = r(t) - 2r(t-1) + r(t-2)$



B Given $x_1(t) = e^{-2t}\,u(t)$ *and* $x_2(t) = e^{-3t}\,u(t)$ Using Laplace Transform Determine y(s) where **(4)**

$$y(t) = x_1(t-2) * x_2(-t+3)$$

C Find inverse Laplace transform of $x(s) = \frac{s^2+2s+5}{(s+3)(s+5)^2}$ for Re(s)> −3 **(3)**

D Find initial and final values for the following Laplace transforms **(3)**

$$(i)\quad x(s) = \frac{s+5}{s^2+3s+2} \qquad (ii)\quad x(s) = \frac{s^2+5s+7}{s^2+3s+2}$$

Q.4 **A** Using z-transform compute output y(n) for **(5)**

$x(n) = u(n)$ *and* $h(n) = \propto^n \quad 0 < \propto < 1$

B Determine z-transform of the following signal **(5)**

$x(n) = \frac{1}{2}(n^2 + n)\ \frac{1}{3}^{n-1} u(n-1)$

C Determine for all possible signals x(n) associated with z-transform x(z). Show ROC in s-palne in each case. **(5)**

$$x(z) = \frac{5\,z^{-1}}{(1 - 2z^{-1})(1 - 3z^{-1})}$$