2123
B.E. (Electronics and Communication Engineering)
Third Semester
EC-302: Signals and Systems

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Section. Use of scientific calculator is allowed.

x-x-x

Q.1 Attempt all questions:-
    (a) Define the impulse function and plot $\delta(t+2) - \delta(t-3)$.   (2)
    (b) State Parseval's theorem.   (2)
    (c) Define Energy and power signal.   (2)
    (d) What is the Aperture effect?   (2)
    (e) Find the z-transform and its ROC of $\delta(n-2)$.   (2)

Section- A

Q. 2(a) Obtain the condition under which two signals $f_1(t)$ and $f_2(t)$ are said to be orthogonal to each other.   (5)

(b) Determine whether the following function is periodic or not. If so find the period. $x(t) = 3\sin 200\pi t + 4\cos 100t$.   (5)

Q.3 (a) Derive the necessary expression to represent the function (t) using Trigonometric Fourier Series.   (5)
    (b) Compute the convolution $X_1(t) = \cos t\, u(t)$ and $X_2(t) = u(t)$.   (5)

Q.4 (a) Find the Fourier transform of Unit step signal.   (5)
    (b) Determine the Nyquist sampling rate and Nyquist sampling interval for the signals given by (i) $x_1(t) = 2\,\text{sinc}(100\pi t)$ and (ii) $x_2(t) = \text{sinc}(80\pi t)\text{sinc}(80\pi t)$..   (5)

Section-B

Q.5 (a) Find the Laplace transform and ROC for the signal $x(t) = e^t \sin 2t$, $t \le 2$.   (5)
    (b) State and prove Time scaling property of Laplace transforms.   (5)

Q.6 (a) Explain Region of convergence in Z-Transform.   (5)
    (b) Calculate Z-Transform of $x(n) = a^n u(n) - b^n u(-n-1)$.   (5)

Q.7 (a) Explain State transition matrix and its importance.   (5)
    (b) Find initial and final vales of $X(s) = (s+4)/(s^2+3s+5)$.   (5)

x-x-x