Exam. Code: 0927
Sub. Code: 6898

2021

B.E. (Electronics and Communication Engineering)

Third Semester

EC-302: Signal and Systems

Time allowed: 3 Hours Max. Marks: 50

NOTE: *Attempt <u>five</u> questions in all, including Question No. I which is compulsory and selecting two questions from each Section*

x-x-x

I. **(a)** Determine whether the following signal is energy or power signal or neither

$x(t) = tu(t)$ **(2)**

(b) Determine and explain Fourier Transform of unit impulse function. **(2)**

(c) What is Aliasing? **(2)**

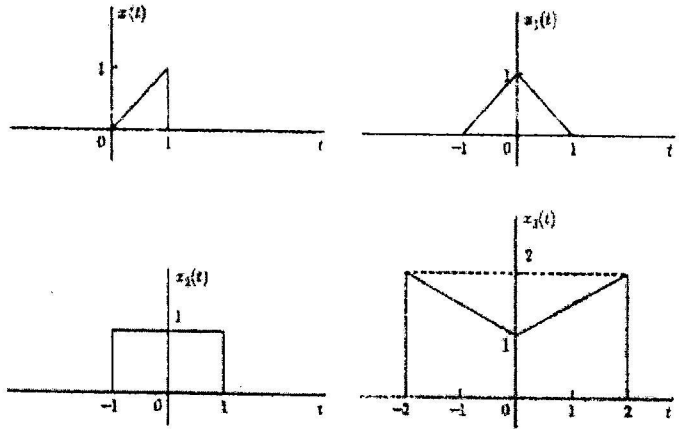
(d) Determine whether or not the following signals is periodic. If a signal is periodic, determine its fundamental period. **(2)**

(i) $(t) = \cos t + sin\sqrt{2}\, t$ (ii) $x[n] = e^{j\frac{\pi}{4}n}$

(e) What do you mean by state transition matrix? **(2)**

Section- A

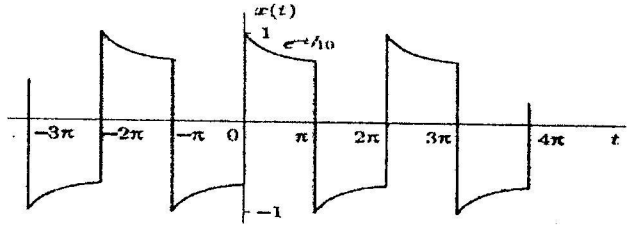
II. **(a)** Express signals $x_1(t)$, $x_2(t)$ and $x_3(t)$ in terms of signal x(t) and its time-shifted, time-scaled, or time-reversed versions. **(6)**



(b) For the following discrete time signals, determine whether the system is causal and stable or not. (i) $y(n) = x(n+7)$ (ii) $y(n) = x^3(n)$ **(4)**

P.T.O.

III. (a) Find the trigonometric Fourier series for the given signal. **(7)**



(b) Find Fourier Transform of Signum Function i.e sgn(t). **(3)**

IV (a) Show that Fourier transform of Gaussian pulse is also a Gaussian signal. **(5)**

(b) Find Nyquist rate and Nyquist interval of following sequence

(i) x(t)= sinc(200πt) sin(150πt) (ii) $x(t) = \text{sinc}^2(50\pi t)$ **(5)**

Section-B

V. (a) Find Laplace transform of following signals (i) unit-step (ii) unit-ramp (iii) unit impulse. **(3)**

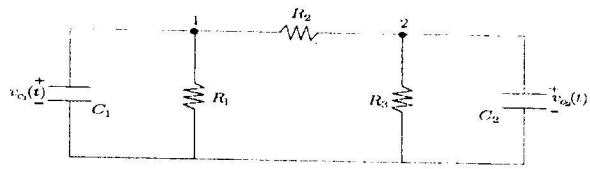
(b) Find DTFT of x[n] = u [n-2] – u [n-6]. **(4)**

(C) Find IDTFT of $X(e^{j\omega}) = cos^2(\omega)$. **(3)**

VI. (a) Determine the z-transform of following finite duration sequence X(n)={1,2,4,5,0,7} with element 7 is at origin. **(3)**

(b) Find the Z-transform of the signal $x(n) = \left(-\frac{1}{5}\right)^n u(n) + 5\left(\frac{1}{2}\right)^n u(-n-1)$. **(7)**

VII (a) Consider the network shown below. The initial voltages across the capacitor C_1 and C_2 are 1/2V and 1V respectively. Using the state variable method, find the voltages across these capacitors for t > 0. Assume that $R_1 = R_2 = R_3 = 1\Omega$ and $C_1 = C_2 = 1F$. **(10)**



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