S.E - IV sem - Biomed

216115

Sub: Signal and Systems.

(20)

Bm/IV/CBGS/SS

Q.P. Code : 3582

(3 Hours) **[Total Marks : 80**

N.B. : (1) Question No. 1 is compulsory.
(2) Attempt any three questions of the remaining questions.
(3) Assume suitable data.

1 (a) Determine whether the signal is periodic, calculate its fundamental period. **20**

$$x(t) = -5 + 3\sin 5t + \cos 3.8t + \cos 7.5t$$

(b) Check whether given signal is energy or power

$$x(n) = n\,u(n)$$

(c) Classify the following system in terms of it's linearity, time invariance causality, memory.

$$y(n) = 2x(n+1) + 5$$

(d) Check orthogonality of the signals over one period

$$x_1(n) = e^{j\left(\frac{\pi}{4}\right)n}; \quad x_2(n) = e^{j\left(\frac{\pi}{8}\right)n}$$

2. (a) Find the convolution and sketch the response **10**

$$x(t) = e^{-at}u(t-1) \quad ; \quad h(t) = e^{-bt}u(t+3) \quad ; \quad \text{both } a, b > 0.$$

(b) Find the initial and final value of **10**

$$X(S) = \frac{2S}{S^2 + 3S + 2}$$

3. (a) Prove the periodicity property and the time shifting property of the Laplace transform. **10**

(b) Find the Z transform of the following. **10**

$$X(z) = \frac{Z^2}{(Z-0.5)(Z-1)^2} \qquad |Z| > 1$$

4 (a) Given the Signal $x(n) = u(n+1) - u(n-3) + \delta(n)$ **10**

Sketch the following :

(i) $x(n)$
(ii) $x(n-3)$
(iii) $x(2n+2)$
(iv) $x[-(n/2) + 2]$
(v) $2x(n)$

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(b) Find the even and odd part of the signal 10

$$x(t) = t + \frac{1}{2}; \quad -\frac{1}{2} \le t \le \frac{1}{2}$$

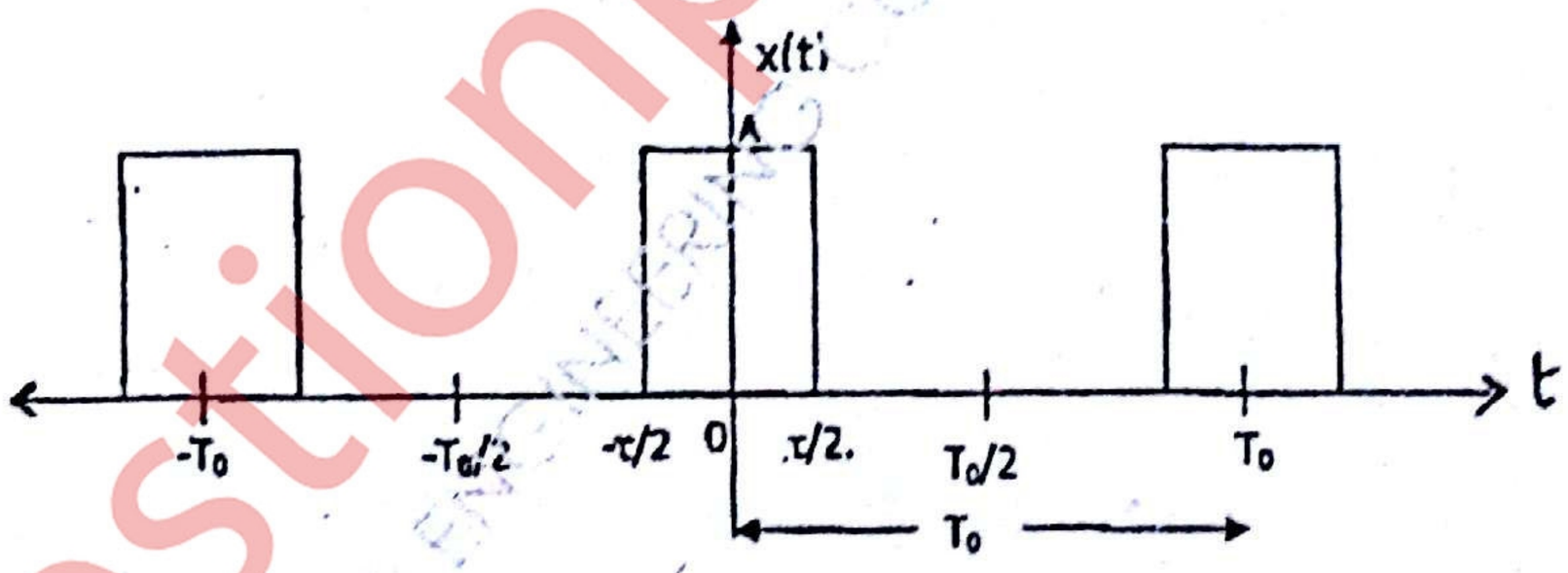
$$= \frac{3}{2} - t; \quad \frac{1}{2} \le t \le \frac{3}{2}$$

5 (a) Using the properties find the Laplace transform of the following : 10

(i) $x1(t) = e^{-4t}\, u(t) * u(t-5)$

(ii) $x2(t) = x(t) \cos 7t$ where, $X(s) = \frac{(s+2)}{(s^2+4s+5)}$

(b) Find the exponential Fourier Series for the rectangular pulse train and sketch the spectrum. 10



6. (a) Find the DTFT for the following signal and plot the magnitude and phase spectrum. 10

$$x1(n) = 0.2\{u(n) - u(n-12)\}$$

(b) Compute Fourier transform for the following signal and also plot the magnitude and phase spectrum. 10

$$x(t) = (te^{-3t} \sin 8t)u(t)$$
