

T. E / Sem V / Inst / CBGS / Mar 17 / 09 / 06 / 17

Q. P. Code : 597800

(3 Hours)



Total Marks: 80

N.B.: (1) Question no. 1 is compulsory

(2) Solve any three questions from question no. 2 to question no. 6.

(3) Assume suitable data if required.

1. Solve any four questions.

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- a) State and prove Parseval's theorem.
 b) If $x_1(n)$ & $x_2(n)$ are two periodic sequences given below, find the convolution between them.

$$x_1(n) = (1, -3, 0, 1) \text{ \& } x_2(n) = (1, 1, 1, 0)$$

- c) Prove that $\int_{-\infty}^{\infty} x^2(t) dt = \int_{-\infty}^{\infty} x_e^2(t) dt + \int_{-\infty}^{\infty} x_o^2(t) dt$
 d) Find the initial value and final value of the following Z-domain signal

$$X(z) = \frac{1}{1 - z^{-2}}$$

- e) State all the properties of Laplace transform & derive time shifting property.

2. (a) Find inverse Laplace Transform for all possible ROCs.

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$$x(s) = \frac{3s + 7}{s^2 - 2s - 3}$$

(b) Let $x(n) = \delta(n) + 2\delta(n-1)$ & $h(n) = 2\delta(n+1) + 2\delta(n-1)$ compute $y(n)$.

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3. (a) Determine whether following signals are periodic or not. If periodic, find fundamental period.

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i. $x[n] = \cos\left(\frac{\pi n}{2}\right) - \sin\left(\frac{\pi n}{8}\right) + 3\cos\left(\frac{\pi n}{4} + \frac{\pi}{3}\right)$

ii. $x(t) = 3\cos\left(5t + \frac{\pi}{6}\right)$

(b) Find whether the signals are Energy or power signal.

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i. $x(t) = A e^{-10t} u(t)$

ii. $X[n] = u[n]$

(c) Sketch a given signal:

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$$x(t) = 2u(t) - u(t-2) + u(t-4) - r(t-6) + r(t-8)$$

[TURM OVER]

4. (a) Determine whether following systems are static or dynamic, linear or non-linear, time variant or invariant, causal or non causal & stable or unstable.

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i. $y(t) = x(t) \cos(100\pi t)$

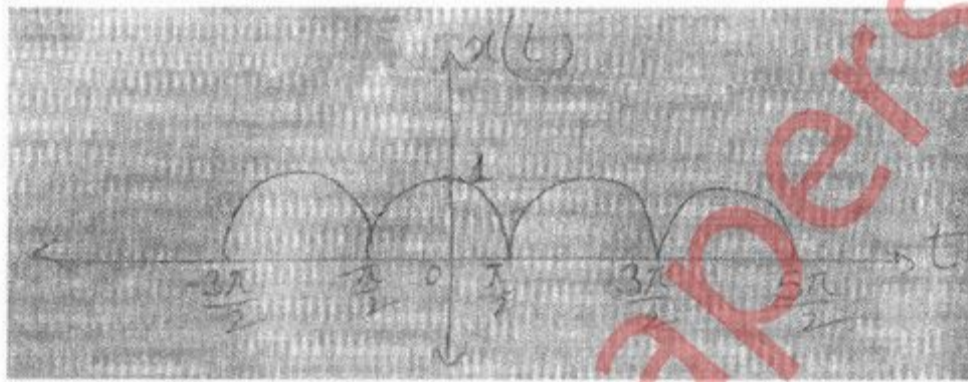
ii. $y(n) = 2x(2^n)$

(b) $y''(t) + 3y'(t) + 2y(t) = x(t)$ with initial conditions $y(0) = 3$, $y'(0) = 4$ find $y(t)$, If $x(t) = 4e^{-2t}u(t)$

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5. (a) Find trigonometric Fourier series of following signal

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(b) Find out Z - Transform and R.O.C. of following signals.

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i. $x[n] = (0.6)^n u[n] + (0.9)^n u[n]$

ii. $x[n] = 2^n u[n] + 3^n u[-n-1]$

6. (a) State the relationship between Laplace and Fourier transform

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(b) Find odd and even part of given signal.

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i. $x(t) = 1 + t \cos t + t^2 \sin t + t^3 \sin t \cos t$

ii. $x(t) = (1+t^3)(\cos^3 10t)$

(c) By residue method, find inverse Z.T. of

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$$X[z] = \frac{(1 - e^{-a})z}{(z - 1)(z - e^{-a})}$$