

Please check whether you have got the right question paper.

- N.B:
1. Question no 1 is compulsory.
 2. Attempt any three questions from remaining questions.
 3. Solve every question in serial order.

- Q.1 Attempt any four: 05
- a. Distinguish between power signal & energy signal. Is $X(t) = e^{2t}u(t)$ is energy or power signal determine its energy or power. 05
 - b. State & prove time shifting property of Z transform. 05
 - c. Check whether the following system is linear, Time Invariant, Causal, or otherwise: 05
 - i. $y(t) = x(t)^2$;
 - ii. $y(t) = x^2(t)$
 - d. LTI system is stable, if its impulse response is absolutely summable. Justify. 05
 - e. Obtain DTFT and plot magnitude & phase response of $x(n) = \{2,3,1,1\}$ 05
 - f. Define ESD & PSD. Specify relationship of ESD & PSD with autocorrelation function. 05
- Q.2 a. A continuous Time signal, $x(t) = \begin{cases} 1; & \text{For } -1 \leq t \leq +1 \\ 0; & \text{Elsewhere} \end{cases}$ 10
- Sketch the following version of the signal:
- i. $x(t-3)$
 - ii. $-2x(t)$
 - iii. $X(t-3) - 2x(t)$ 05
- b. Sketch Even & Odd Part of Unit step signal. 05
- c. Obtain linear convolution of following two sequences:
 $X(n) = \{1,2,4,1\}$; $h(n) = \{2,2,1,-1\}$
- Q.3 a. Compute the linear convolution of following two sequences; 10
 $x_1(n) = \{1,2,3,3\}$; $x_2(n) = \{1,4,2,1\}$. Using DFT/IDFT technique only.
- b. Derive the relationship between transform & Z Transform. 05
- c. State minimum three properties of CTFT & DTFT. 05
- Q.4 a. Find the direct form -1 & direct form – II realization of LTI system governed by following 10
 difference Equation $y(n) = -\frac{3}{8}y(n-1) + \frac{1}{32}y(n-3) + x(n) + x(n-1) + 2x(n-2)$.
- b. Determine the z transform & specify & draw ROC of following functions: $x(n) = (\beta)^2u(-n-1)$. 05
- c. Find the impulse response of system described following difference equation: 05
 $y(n) - 2y(n-1) - 3y(n-2) = x(n) + 2x(n-1)$
- Q.5 a. Find the inverse Laplace transform of function: $X(s) = \frac{4}{(s+3)(s+5)}$ for the following ROC: 10
- i. $R_e\{S\} > -3$
 - ii. $R_e\{S\} < -5$
 - iii. $-5 < R_e\{S\} > -3$
- b. Find the initial value & final value of following function: $X(s) = \frac{1}{s+2}$. 05
- c. State & prove time shifting property of Laplace transform. 05
- Q.6 a. Derive the relationship between Autocorrelation function & energy spectral Density. 10

(P.T.O.)

b. A LTI system function is given by, $H(z) = \frac{2-3z^{-1}}{1-2.5z^{-1}+0.5z^{-2}}$.

Determine $h(n)$, if,

- i. system is Stable
- ii. the system is Casual
- iii. the system is anti-causal

Specify ROC of $H(Z)$ in all cases.
