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VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
B.E. II Year (I.T.) I-Semester Supplementary Examinations, May/June-2017

Signals and Systems

Time: 3 hours

Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 X 2=20 Marks)

1. Differentiate energy signal and power signal.
2. What is Signum function? How it is related with unit step function?
3. Define Static and Dynamic systems.
4. Define natural response and forced response of an LTI system.
5. What are orthogonal functions? List out orthogonal functions.
6. What is Gibbs phenomenon?
7. Why the ROC of Laplace Transform cannot contain any poles?
8. What will happen when the signal is under sampled? Explain.
9. Under what conditions discrete time Fourier transform and Z-transform are identical?
10. Define Region of Convergence of Z-Transform.

Part-B (5 × 10 = 50 Marks)

(All bits carry equal marks)

11. a) Let $x(t)$ is an energy signal with energy $E[x(t)]$, and let 'T' be a non-zero, finite, real valued constant. Prove that $E[x(t - T)] = E[x(t)]$. Comment on the result.
 b) Find the convolution of two signals : $x(n) = y(n) = \{1, 2, 3, 4\}$.
12. a) Classify the systems with examples.
 b) Test for the linearity, causality, time invariance and stability of the system governed by the equation: $y(n) = x(n) + nx(n - 1)$
13. Express the function e^t over interval $0 < t < 1$ by
 a) Trigonometric Fourier series.
 b) Exponential Fourier series.
14. a) State and prove sampling theorem of band limited signals.
 b) Find the inverse Laplace transform of $\frac{3s}{(s^2+1)(s^2+4)}$.
15. a) State and Prove the Time shifting and Convolution in time domain properties of Discrete Time Fourier Transform (DTFT).
 b) Find inverse Z-transform of $X(Z) = \frac{Z}{3Z^2 - 4Z + 1}$ if the region of convergence in three case are: $Z > 1, Z < \frac{1}{3}$ and $\frac{1}{3} < Z < 1$.
16. a) Write a MATLAB program to find the even and odd parts of a signal $x(t) = e^{-3t}$.
 b) Derive the expression for convolution integral of an LTI system.
17. Answer any *two* of the following:
 a) A filter has an input $x(t) = e^{-2t} u(t)$ and transfer function $H(w) = \frac{1}{1+jw}$. Find the ESD of the output.
 b) State and prove initial and final value theorem of Laplace transform.
 c) Determine the system function of a Discrete Time LTI system described by the difference Equation $y(n) - \frac{1}{3}y(n - 1) + \frac{1}{5}y(n - 2) = x(n) - 2x(n - 1)$. Also discuss the stability.
