M 27019

Reg. No. : ....

Name : ....

IV Semester B.Tech. Degree (Reg./Sup./Imp. – Including Part Time) Examination, May 2015
(2007 Admn. Onwards)
PT2K6/2K6 EC/AEI 404 : SIGNALS AND SYSTEMS

Time : 3 Hours Max. Marks : 100

PART – A

I. 1) Define Unit Impulse and Unit Step Signals and prove that (n) = u(n) – u(n – 1).

2) State Initial and Final Value Theorem of Laplace Transforms and what are the Laplace transform of $\delta(t)$ and u(t) ?

3) Define BIBO stability prove the relation onh(t) for the system to be stable.

4) Check whether the following system is linear or not ? Prove it

$$y(n) = \frac{x(n-5) + x(n-7)}{x(n-2)\, x(n-3)}.$$

5) Check whether the causal system with transfer function $h(s) = \frac{1}{s^2}$ is stable.

6) What is ROC in Z transforms and what is z transform of sequence $X(n) = a^n u(n)$.

7) What is the relation between DTFT and Z transform ? And find DTFT of u(n).

8) Define system function. And define shifting property of the discrete time unit impulse function. **(8×5=40)**

P.T.O.

PART – B

II. a) Distinguish between the following :

i) Continuous time signal and discrete time signal.

ii) Unit step and Unit Ramp functions.

iii) Periodic and Aperiodic Signals.

iv) Deterministic and Random Signals. **15**

OR

b) If 'E' is the energy of a signal x(t). What is the energy of x(2t) and x(t/2). **6**

c) Find the natural and total responce of the system described by the differential equation : $\frac{d^2y(t)}{dt^2} + \frac{6\,dy(t)}{dt} + 8y(t) = \frac{dx(t)}{dt} + 2x(t)\; x(t) = e^{-t}u(t)$. The initial conditions are $y(0^+) = 2$, $\frac{d}{dt}y(0^+) = 3$. **9**

III. a) Determine the Fourier Transform for double exponential pulse whose function is given by $x(t) = e^{-2t}$. Also draw its magnitude and phase spectra. Obtain inverse Laplace Transform of the function

$$X(s) = \frac{1}{s^2 + 3s + 2}, \text{ROC}: -2 < \text{Re}\{s\} < -1.$$ **15**

OR

b) State and prove the properties of Laplace Transforms. Solve the differential equation $\frac{d^2y(t)}{dt} + 4\frac{dy(t)}{dt} + 5y(t) = 5x(t)$ and $x(t) = u(t)$. **15**

IV. a) Determine the impulse response h(t) of the system given by the differential equation $\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = x(t)$ with all initial conditions to be zero. **10**

b) Obtain DF-I realization of, $\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 4y(t) = \frac{dx(t)}{dt}$. **5**

OR

c) Compute and plot the convulation Y(t) of the given signals

i) $X(t) = u(t-3) - u(t-5)$, $h(t) = e^{-3t} u(t)$

ii) $X(t) = u(t)$, $h(t) = e^{-t}u(t)$. **15**

V. a) Prove the sampling theorem and explain how the original signal can be reconstructed from the sampled version. **8**

b) Find the DTFT for the signa $x(n) = u(n-2)$. **7**

OR

c) Find the inverse Z transform of $X(z) = 1/\left(1-0.5z^{-1}+0.5z^{-2}\right)$ for ROC $|Z|>1$. **7**

d) State and prove the following properties of Z transform. **8**

i) Linearity

ii) Time shifting

iii) Differentiation

iv) Correlation.