

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), November 2016
B. Tech. in Electronics & Communication Engineering, Semester V

Roll No.....

ECE505: Engineering Signals & Systems

Time: 3.0 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
4. Use of Non-Programmable calculator is allowed.

Q.1A Objective type questions (10 questions @ 1 mark)

10

- a. The Fourier transform of a rectangular pulse is
- b. Fourier transform of a dc signal with unity strength is
- c. For distortion less transmission through an LTI system, phase of $H(\omega)$ is dependent on ω . (Yes/No)
- d. $t\delta(t) = 0$ (True/False)
- e. Write the Hilbert transform of $5\cos(\omega t)$.
- f. The discrete-time signal $x(n) = (-1)^n$ is periodic with fundamental period.....
- g. The auto-correlation function of a rectangular pulse of duration T is.....
- h. z-transform converts convolution of time-signals to.....
- i. The Fourier transform of $u(t)$ is.....
- j. When two honest coins are simultaneously tossed, the probability of two heads on any given trial is.....

Q.2 Each Question is of 2.5 marks

10

- a. What do you understand with Aliasing? How it can be removed?
- b. Write a short note on time varying systems.
- c. A band pass signal extends from 1 KHz to 2 KHz. Find the minimum sampling frequency needed to retain all information in the sampled signal.
- d. Find the step response of a LTI system when the impulse response $h(n)$ is unit step $u(n)$.

Q.3A Determine the Nyquist rate and Nyquist interval for each of the following 05 signals:

- a. $x(t) = \text{sinc}(200t)$
- b. $x(t) = \cos(300\pi t) + \sin(1500\pi t)$

Q.3B Consider a signal $x(t) = \cos(200\pi t) + 2\cos(280\pi t)$. Now the signal is sampled at 05 the rate of 300 Hz. If the sampled signal is passed through ideal Low pass filter

with a cut off frequency of 250 Hz. Which frequency components will be present in the output? Also draw the spectrum.

- Q.4A Let $x(t) = e^{-2t} u(t)$ and $y(t) = x(t+1) + x(t-1)$. Find $F(\omega)$. 05
 Q.4B Explain time expansion property of Fourier transform. 05
 Q.5A Explain about the stability of system 05

$$H(z) = \frac{z(3z-4)}{(z-0.4)(z-2)}$$

- Q.5B Determine the z transform and ROC of the following finite duration signals 05
 a. $x(n) = \{1, 2, 6, -2, 0, 3\}$
 b. $x(n) = \{1, 2, 6, -2, 0, 3\}$

- Q.6A Determine the Laplace transform of the following signals and plot the ROC and location of poles and zeros in the s plane. 05
 a. $x(t) = e^{-at} u(t)$
 b. $x(t) = -e^{-at} u(-t)$

- Q.6B Determine the Laplace transform of the following signals 05
 a. $x(t) = r(2t-3)$
 b. $x(t) = u(2t+1)$

- Q.7A For the following system functions, check the causality and stability of the system. 05

$$H(s) = \frac{1}{(s-3)(s+2)} \quad R\{s\} > 3$$

OR

- Q.7A Determine the z transform of $x(n) = \cos(\omega_0 n) u(n)$ and depict the ROC and the locations of poles and zeros in the z plane. 05
 Q.7B Determine the z transform of $x(n) = (1/2)^n u(n) + 2^n u(-n-1)$ and depict the ROC and the locations of poles and zeros in the z plane. 05

- Q.8 Determine the z transform of the sequence $g(n) = n a^n u(n)$ 10

OR

- Q.8 Explain initial and final value theorem of Laplace transform. 10

Q.9 Determine the signal $x(n)$ whose z transform is given by

10

$$X(z) = \frac{1}{1-1.5z^{-1}+0.5z^{-2}} \quad \text{if}$$

- a. ROC $|z| > 1$
- b. ROC $|z| < 0.5$
- c. ROC $0.5 < |z| < 1$

Q.10 Find the inverse Laplace transform of

10

$$X(s) = \frac{-5s-7}{(s+1)(s-1)(s+2)}$$

If the ROC

- a. $\text{Re}\{s\} > 1$
- b. $\text{Re}\{s\} < -2$
- c. $-1 < \text{Re}\{s\} < 1$
- d. $-2 < \text{Re}\{s\} < -1$