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## ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

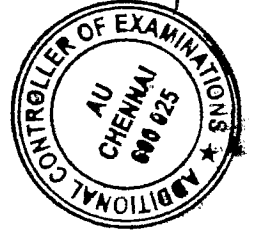
B.E / B. Tech (Full Time) END SEMESTER EXAMINATIONS – NOV / DEC 2019

Electronics and Communication Engineering

Third Semester

EC9203 Signals and Systems

(Regulation –2008)



Time: 3 Hours

Answer ALL Questions

Max. Marks 100

**PART- A (10 x 2 = 20 Marks)**

Q.N o	Question s	Mark s
1.	Write the condition for a signal to be periodic and test the periodicity of the signal $x(t) = \sin(100\pi t)$ .	2
2.	When can a system be called as LTI system?	2
3.	Write Dirichlet conditions for the existence of Fourier series for a periodic signal.	2
4.	Write Laplace transform of unit impulse signal and its ROC.	2
5.	Define frequency response of a LTI system.	2
6.	Let $H(s)$ be the transfer function of a LTI system. Write the condition on its ROC for the system to be stable.	2
7.	State low pass sampling theorem.	2
8.	Write time shifting property of DTFT.	2
9.	Differentiate direct form I and direct form II structures.	2
10.	Input $x[n]$ and output $y[n]$ of a DT LTI system is described by $y[n] = x[n] - x[n-1]$ . Find transfer function of the system.	2

**PART- B (5 x 16 = 80 Marks)**

(Q. No 11 is Compulsory)

Q.N o	Question s	Mark s
11.	<p>a) (i) Classify the signals <math>x(t) = e^{-at} u(t)</math> under even/odd, periodic and energy/power categories</p> <p>(ii) Let the input <math>x[n]</math> and output <math>y[n]</math> of DT system is given as,</p> $y[n] = x[n] + x[n-3]$ <p>Classify the system under linearity, time invariance, causality, stability and recursive with justifications.</p>	<p>2+2+ 4</p> <p>3+2+ 1+1+ 1</p>

12.	a) Find the Fourier series of a square wave and draw its magnitude and phase spectrums.	16
	OR	
	b) Find the Laplace transform for following signals and mark poles, zeroes and ROC in s-plane. (i) $x(t) = e^{-at} u(t) + e^{-bt} u(t)$ , (ii) $x(t) = e^{-3t} \cos(2t) u(t)$	16
13.	a) Consider a LTI system has impulse response $h(t) = u(t)$ . Determine (i) the frequency response of the system (ii) the output of the system for the input $x(t) = e^{-at} u(t)$ .	8 8
	OR	
	b) Let a CT LTI system is described $\frac{d^2 y(t)}{dt^2} + 5 \frac{dy(t)}{dt} + 6y(t) = x(t)$ . Determine, (i) the impulse response of the system (ii) unit step response of the system.	8 8
14.	a) (i) State any convolution property of DTFT and prove the same. (ii) Find the convolution of $x[n] * x[n]$ where, $x[n] = 0.5^n u[n]$ .	8 8
	OR	
	b) (i) List any four properties of ROCs of Z-transform and give example (ii) Find all possible signals $x[n]$ that has Z-transform $X(z) = \frac{1-z^{-1}}{1-z^{-1}+0.25 z^{-2}}$	8 8
15.	a) Consider a causal LTI system is described by, $y[n-2] - (1/3) y[n-1] + (1/6) = x[n] - x[n-1]$ . (i) Determine its transfer function and impulse response. (ii) Draw the Direct form-I, direct form II, cascade form and parallel form realization structure of the system.	8 8
	OR	
	b) Consider a DT LTI system has transfer function $H(z) = \frac{1-z^{-1}}{1+\frac{1}{4}z^{-1}+\frac{1}{8}z^{-2}}$ (i) Derive the difference equation that describes the system. (ii) Find all possible cases for its impulse response and comment of causality and stability of the system for each case.	4 12

