Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E / B. Tech (Full Time) END SEMESTER EXAMINATIONS – NOV / DEC 2011

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.No	Questions	Marks
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.No	Questions	Marks
11.	a) (i) Classify the signals $x(t) = e^{-at} u(t)$ under even/odd, periodic and energy/power categories	2+2+4
	(ii) Let the input x[n] and output y[n] of DT system is given as, $y[n] = x[n] + x[n-3]$ Classify the system under linearity, time invariance, causality, stability and recursive with justifications.	3+2+1+1+1

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 $\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = x(t)$. 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