## **GUJARAT TECHNOLOGICAL UNIVERSITY** BE - SEMESTER-V • EXAMINATION – SUMMER • 2015

Subject Code: 150303 Date: 11/0 Subject Name: SIGNAL & SYSTEMS			5/2015	
Time:02.30pm – 05.00pm Total Mar			70	
Inst	1. 2.	ons: Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks.		
Q.1	(a)	Design a second order notch filter to have zero transmission at 125 Hz and a sharp recovery of gain to unity on both sides of 125 Hz. The significant frequency to be processed is $fh = 200$ Hz.	07	
	<b>(b</b> )	Give classification of signals with examples.	07	
Q.2	<b>(a)</b>	For a system specified by the equation $y[n+1] - 0.8y[n] = x[n+1]$ Find the frequency response of this LTID system.	07	
	(b)	Prove that if $x[n]u[n] \leftrightarrow X[z]$ then $x[n-m]u[n] \leftrightarrow z^{-m}X[z] + z^{-m}\sum_{n=1}^{m} x[-n]z^{n}$ OR	07	
	(b)	Prove that if $x[n]u[n] \leftrightarrow X[z]$ then $x[n-m]u[n] \leftrightarrow z^{-m}X[z] + z^{-m}\sum_{n=1}^{m} x[-n]z^n$	07	
Q.3	(a)	Determine the z-transform of $X[n]=(0.9)^n u[n] + (1.2)^n u[-(n+1)]$	07	
	<b>(b</b> )	Find the inverse z transform of $X[Z] = \frac{-z(Z+0.4)}{(Z-0.8)(Z-2)}$ , If the ROC is	07	
		a) 0.8<  Z  <2		
		b) $ Z  > 2$ OR		
Q.3	<b>(a)</b>	Sketch the following signals:	07	
		i) $u(-t+2)$ ii) $u(t+2) + u(t+1)$		
		ii) $u(t-5) + u(t+1)$ iii) $u(2t+1)$		
	<b>(b)</b>	Obtain canonic direct and transposed canonic realization of following Transfer	07	
		Functions i) $5/(z+27)$		
		i) $(z+1)/(z^2+5z+6)$		
Q.4	(a)	Explain the phenomena of signal reconstruction and also discuss difficulties associated	07	
	( <b>b</b> )	with signal reconstruction? Determine which of the systems with input f(t) and output y(t) are linear and	07	
	(0)	which are non-linear.	07	
		i) $dy/dt + 3t y(t) = t^2 f(t)$ ii) $dy/dt + y^2 = f(t)$		
		OR		
Q.4	<b>(a)</b>	Find the convolution of $x_1(t)$ and $x_2(t)$ for the following signals: i) $x_1(t) = e^{-at}u(t)$ and $x_2(t) = e^{-bt}u(t)$	07	
		ii) $x_1(t) = tu(t) \text{ and } x_2(t) = u(t)$		
	<b>(b</b> )	Justify that PCM is an application of Sampling Theorem.	07	
Q.5	(a)	Explain the application of Fourier Transform? And compute Fourier Transform of $x[n] = (1)^n u(n)$ .	07	

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(b) Explain properties of Discreet Fourier Transform and compute four point DFT  $x(n) = \{0, 1, 2, 4\}$ 

## OR

- (a) Explain the term "System" and classify the systems on basis of its properties (b) Solve the differential equation (D2+3D+2)y(t) = Dx(t). if the initial conditions Q.5 07 07
  - are y(0+) = 2 and y'(0+)=3 and the input is a)  $10e^{-3t}$ 
    - b) 5

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