Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2018

Subject Code: 2172409   **Date: 29/11/2018**

Subject Name: Digital Signal Processing for Power Electronics

Time: 10:30 AM TO 01:00 PM   **Total Marks: 70**

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	If $h(n) = (0.2)^n u(-n) + (3)^n u(-n)$ will it be stable?	**03**
	(b)	For $x(n) = \{-1,0,1,2,1,0,1,2,1,0,-1\}$, Plot $x(n)$ & find $X(e^{jw})$ at w = 0. ↑	**04**
	(c)	Determine and plot the response of an LTI system whose input $x(n)$ and impulse response $h(n)$ is given by $x(n) =\{\underline{1},2,-1,-2\}$ & $h(n) = \{ \underline{1},2,3,4\}$.	**07**
Q.2	**(a)**	Enlist application of DSP for power electronics field.	**03**
	(b)	How pipelining improve the computational speed?	**04**
	(c)	An LTI system has impulse response $h(n) = 5(-1/2)^n u(n)$. Determine Fourier transform to find the output of this system when the input is $x(n) = (1/3)^n u(n)$.	**07**

OR

	(c)	Find the 4- point DFT of the sequence $x(n) =\{1,0,2,1\}$. ↑	**07**
Q.3	**(a)**	Give difference between linear and circular convolution.	**03**
	(b)	Find the IDFT of $Y(k) =\{1,0,1,0\}$. ↑	**04**
	(c)	Define sampling. State and explain sampling theorem.	**07**

OR

Q.3	**(a)**	State relation between DFT and Z-transform.	**03**
	(b)	Discuss frequency spectrum using DFT.	**04**
	(c)	What is aliasing?	**07**

Given $x(t) \overset{FT}{\longleftrightarrow} X(w)$. For the spectrum of the continuous-time signal, shown in Fig.1, consider the three cases $f_s = 2f_x$; $f_s > 2f_x$ and $f_s < 2f_x$; draw the spectra, indicating aliasing.
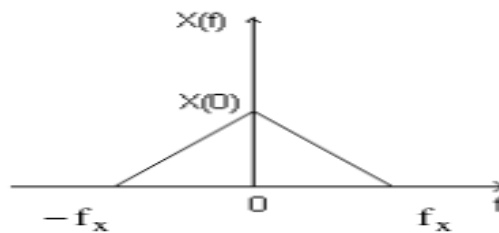
Fig1.

Q.4 **(a)** What are the basic elements used to construct block diagram of a discrete time system? **03**

(b) (i) Evaluate $\delta(n-1) * \delta(n+1)$ .Plot the resultant sequence. **04**

(ii) Prove that $\delta(n) = u(n) - u(n-1)$.

(c) Consider a LTI system with system function as follows: **07**

$H(z) = (1+2z^{-1} + z^{-2}) / (1 - 0.75 z^{-1} + 0.125 z^{-2})$. Obtain second order parallel form structure.

OR

Q.4 **(a)** Explain one-sided Z-transform. **03**

(b) Classify various signals used for signal processing. **04**

(c) Sketch the cascaded form structure of the FIR system given by difference equation $y(n) + y(n-1) + 0.25y(n-2) = x(n)$. **07**

Q.5 **(a)** Discuss the effect of quantization. **03**

(b) What is the difference between von Neumann and Harvard architecture? **04**

(c) Discuss the concept of zero input limit cycle oscillation. How this can be eliminated? **07**

OR

Q.5 **(a)** What are the different formats of fixed point representation? **03**

(b) Draw only the block diagram of basic generic hardware architecture for digital signal processor **04**

(c) Explain DIT- FFT algorithm using signal flow graphs for N= 4. **07**

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