B.E. Instrumentation Engineering Fifth Semester IN502 - Signals and Systems

P. P. Tim	ages : e : Thi	3 ree Hours $\begin{array}{c} & & \\ & & \\ & & \\ & & \\ & & 1 \\ & & 2 \\ & & 1 \\ & & \\$	GUG/W/18/1642 Max. Marks : 80
	Note	 es: 1. Same answer book must be used for each question. 2. All questions carry marks as indicated. 3. Due credit will be given to neatness and adequate dim 4. Assume suitable data wherever necessary. 	ensions.
1.	a)	Sketch the following signals.i) $x(-t)$ ii) $x(t+2)$ iii) $x(2t)$ iv) $x(t-3)$ if $x(t)$ is	8
		$-1 \qquad 0 \qquad 1 \qquad $	
	b)	Test the following systems for linearity, Causality, time invaria i) $y(t)=2x(t)+5$ ii) $y(n)=x(n-3)-1$	ance and memory. $8 + 2x(n-1)$
		OR	
2.	a)	Define the following term with example.i)Energy signal.iii)Even signal.iv)Odd signal.	8
	b)	Represent the following signal using combination of standard s $x(n) = \{0,1,2,3,3,3\}$	signals. 8
3.	a)	Obtain linear convolution of following sequence. $x(n) = \{2,1,2,1\}$ $h(n) = \{-1,0,3,1\}$ Using graphical method.	8
	b)	List out the properties of LTI system. Describe any two with de	etails. 8
		OR	
4.	a)	Obtain the convolution between the two signals. $x(n) = \left(-\frac{1}{3}\right)^{n} u(n)$ $h(n) = \left(\frac{1}{2}\right)^{n} u(n)$	8

		\mathbf{OR}	
	b)	Define the ROC with respect to Z-transform Find the Z-transform and ROC of i) $x(n) = \{3,1,2,0,-1\}$ ii) $x(n) = \{-2, -1, 0, 3, -1\}$	8
7.	a)	Obtain the z-transform of the following. i) $x(n) = sin(wn)u(n)$ ii) $x(n) = cos(wn)u(n)$	8
_	c)	State and derive the convolution property of DFT.	4
	b)	Obtain Fourier series coefficients of the following signal. $x(t)=1+2\cos(w_0t)+3\sin(2w_0t)+\cos(3w_0t)$	4
		$-T/2 \qquad 0 \qquad T/2 \qquad t$ Figure 2	
6.	a)	Find the Fourier transform of the signal shown in figure 2. $\uparrow x(t)$	8
		OR	
	c)	State and prove time reversal property of Fourier transform.	6
	b)	Obtain DFT of discrete time signal $x(n) = \{2,1,3,2\}$	4
5.	a)	Find the Fourier transform of $x(t) = sin(w_0 t)$	6
		ii) $x(n) = e^{-j\frac{s\pi}{2}n}$	

Find out whether the following signal is periodic or non-periodic. If periodic find the

a) A LTI system is characterized by $H(t) = \frac{1 + 2Z^{-1}}{\left(1 - 3 \cdot 3Z^{-1} + 0 \cdot 9Z^{-2}\right)}$ if ROC is |z| > 3ii) 0.3 < |Z| < 3i) iii) |Z| < 0.3Find the Inverse-Z transform.

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b)

i)

fundamental period.

 $x(t) = cos(10\pi t + \pi/2) + 2sin(6\pi t)$

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- Find the step response of the system described by following difference equation. b) y(n)-3y(n-1)+2y(n-2) = x(n)+2x(n-1).
- 9. a) State and prove sampling theorem.
 - A analog signal b) $x_a(t) = \sin(480\pi t) + 3\sin(720\pi t)$

is sampled 600 times per second

- Determine the Nyquist sampling rate for $x_{a}(t)$. i)
- ii) Find the discrete time signal.
- What are the frequencies in radians in resulting discrete time signal x(n). iii)

OR

- Describe any one method of reconstruction of continuous time signal from it's equivalent 10. 8 a) discrete time signal.
 - b) An analog signal is given as, $X_a(t) = \sin(5\pi t) + 2\sin(10\pi t) + 2\cos(15\pi t)$
 - What is Nyquist rate of the signal? i)
 - If the signal is sampled with $f_s = 20$ Hz, Find the discrete time signal obtained after ii) sampling.

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