SVKM's NMIMS
MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT & ENGINEERING

Programme: B.Tech/ MBA Tech (IT) Year: II Semester: III

Academic Year: 2019-20

Subject: Signals and Systems

Date: 14 November 2019

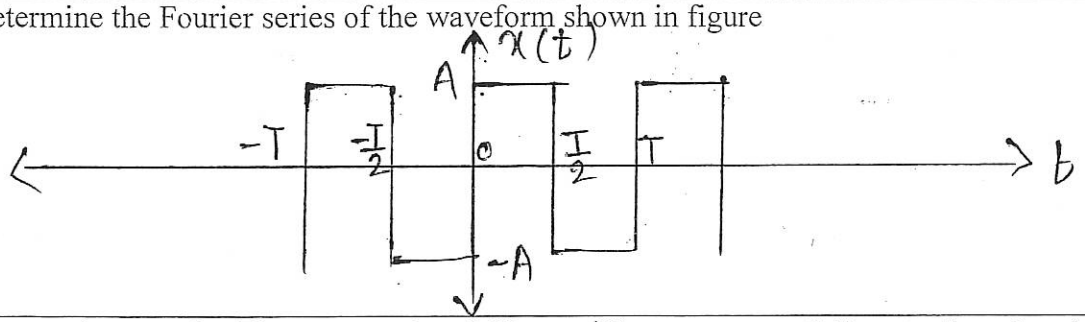
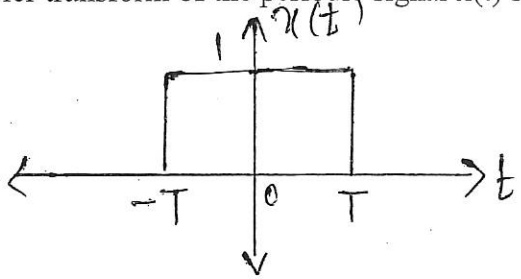
Marks: 100
Time: 2.00 pm - 5.00 pm
Durations: 3 (Hrs)
No. of Pages: 2

Final Examination (2019-20)

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover of the Answer Book, which is provided for their use.

1) Question No. 1 is compulsory.
2) Out of remaining questions, attempt any 4 questions.
3) **In all 5 questions to be attempted.**
4) All questions carry equal marks.
5) **Answer to each new question to be started on a fresh page.**
6) **Figures in brackets on the right hand side indicate full marks.**
7) **Assume suitable data if necessary.**

Q1.	A.	Classify discrete time systems.	[5]
	B.	State and prove the Time shifting property of discrete time Fourier series.	[5]
	C.	Determine Fourier transform of discrete time signal $x(n) = (a)^n u(n)$.	[5]
	D.	What is Region of Convergence (ROC) in Z-Transform? Illustrate any 4 properties of ROC of Z-Transform.	[5]
Q2.	A.	Classify Signals. A continuous time signal is defined as $x(t) = t ; 0 \leq t \leq 3$ $= 0 ; t > 3$ Sketch the waveform of x(-t) and x(2-t).	[10]
	B.I	Verify whether the following continuous time signals are periodic. If periodic, find the fundamental period. (1) $x(t) = 2\cos\frac{t}{4}$ (2) $x(t) = 3\cos(5t + \frac{\pi}{6})$	[5]
	B.II	A discrete time system can be (1) static or dynamic (2) causal or non-causal (3) linear or non-linear (4) time variant or time invariant (5) stable or unstable. Examine the following system with respect to the above properties: $y(n) = 5\,n\,x(n)$	[5]
Q3.	A	Determine the response of LTI system whose input x(n) and impulse response h(n) are given by $x(n)=\{1,2,3,1\}$ and $h(n)=\{1,2,1,-1\}$.	[10]
	B.	Determine the impulse response for the cascade of two LTI systems having impulse	[10]

		responses, $h_1(n) = (1/2)^n u(n)$ and $h_2(n) = (1/4)^n u(n)$	
Q4.	A.I	State & prove properties of Linear convolution.	[5]
	A.II	Find the Fourier series representation of discrete time signal $x(n) = \sin(\frac{\pi}{2}n + \phi)$	[5]
	B.	Determine the Fourier series of the waveform shown in figure 	[10]
Q5.	A.	State and prove the Time reversal and Time scaling property of discrete time Fourier series.	[10]
	B.I	Compare continuous time and discrete time Fourier series.	[5]
	B.II	Determine the Fourier transform of discrete time signal $x(n) = \{1,1,1\}$	[5]
Q6.	A.	State and prove the frequency shifting and frequency differentiation property of discrete time Fourier transform.	[10]
	B.I	Determine the Fourier transform of the periodic signal x(t) shown in figure below 	[5]
	B.II	Determine Z-Transform of discrete time signal $x(n) = n\,(a)^n u(n)$. Also draw ROC.	[5]
Q7.	A.	State & prove the differentiation property of Z-Transform. Determine the inverse Z-Transform of $X(z) = \frac{(8z-19)}{(z-2)(z-3)}$	[10]
	B.	The state space representation of discrete time system is given by, $A = \begin{bmatrix} 2 & -1 \\ 3 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 2 \end{bmatrix}, C = [1 \quad 3], D = [3]$ Derive the transfer function of the system?	[10]