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Name:

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (S,FE) (FT) (WP/PT) Examination May 2025 (2019 Scheme)

Course Code: EET 305 Course Name: SIGNALS AND SYSTEMS

Ma	x. M	Duration: Duration:	3 Hours
		PART A (Answer all questions; each question carries 3 marks)	Marks
1		Find which of the following signals are causal or non-causal?	3
		i) $x_1(t) = e^{at} u(t)$	
		ii) $x_2(t) = e^{-2t} u(-t)$	
2		What are deterministic and random signals?	3
3		Find the Fourier Transform of x (t) = $5 \sin^2(3t)$	3
4		Explain with a neat tabular column Torque-Voltage Analogy	3
5		Define BIBO stability. What is the requirement of BIBO stability?	3
6		What do you mean by order and type of a system ?	3
7		State the Sampling Theorem. Also define the term Nyquist rate.	3
8		Write any three properties of Region of Convergence.	3
9		Find the Fourier transform of $x(n) = a^n u(n)$.	3
10		Find the frequency response of the following causal system	3
		$y(n) = \frac{1}{2}x(n) + x(n-1) + \frac{1}{2}x(n-2)$	
		PART B	
		(Answer one full question from each module, each question carries 14 marks) Module -1	
11	a)	What are periodic and non-periodic signals? Check whether the following signal	16
		is periodic or not: $x(t) = \cos 60\pi t + \sin 50\pi t$	
	b)	Find the convolution of $x_1(t)$ and $x_2(t)$ for the following signals	8
		i) $x_1(t) = t u(t) ; x_2 (t) = u(t)$	
		ii) $x_1(t) = \sin t u(t) ; x_2 (t) = u (t)$	
12	a)	For a full wave rectifier, the output is modulus of the input. Check whether the	e 9
		system is i) Static ii) Linear iii) Time-Invariant	
	b)	Find the even and odd components of the signal $x(t) = \cos t + \sin t + \cos t \sin t$	5

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Module -2

13 a) Write the differential equations governing the mechanical system shown in figure. 10
Draw the Force-Voltage and Force-Current electrical analogous circuits.



b) What are the conditions for existence of Fourier Transform?



4

9

5

b) Obtain the transfer function of the electrical network shown in Figure





15 a) Find the overall gain of the system whose signal flow graph is shown in Figure 10



- b) Derive the expression for response of a First order Closed loop system for Unit 4 Step input.
- a) Using block diagram reduction technique find closed loop transfer function of a system whose block diagram is shown in Figure

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 b) Check the stability of the system represented by the characteristic equation using 6 Routh Stability criterion : s⁴+8s³+18s²+16s+5=0. Comment on the location of roots of the characteristic equation

Module -4

17	a)	Determine the Z-transform of $x(n) = a^n u(n) - b^n u(-n-1)$ and find ROC	8
	b)	Explain the aliasing effect in sampled data systems	6
18	a)	Find the inverse Z-transform of the following:	9
		i) $X(z) = \frac{(\frac{1}{4}z^{-1})}{(1-\frac{1}{2}z^{-1})(1-\frac{1}{4}z^{-1})}$, ROC: $ z > \frac{1}{2}$	
		ii) $X(z) = \frac{(8Z-9)}{(z^2-5z+6)}$, ROC: $ z > 3$	
	b)	Derive the transfer function of Zero Order Hold.	5
		Module -5	
19	a)	Find the DTFS representation for $x(n) = 5 + \sin(\frac{n\pi}{2}) + \cos(\frac{n\pi}{4})$	7
	b)	Find the step response for the following system:	7
		$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n)$ Assume initial conditions to be zero.	
20	a)	Obtain the cascade form realization of the system described by the difference	9
		equation $y(n) - \frac{1}{4}y(n-1) - \frac{1}{8}y(n-2) = x(n) + 3x(n-1) + 2x(n-2)$	
	b)	State and prove the Time-Shifting Property of DTFT	5
