

K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

May – June 2024

Program: B.Tech. (Electronics and Telecommunication) Scheme IIB/ Scheme II

Regular/Backlog Examination: SY Semester IV

Course Code: EXC405 and Course Name: Signals and Systems

Date of Exam: 24/5/2024

Duration: 02.5 Hours

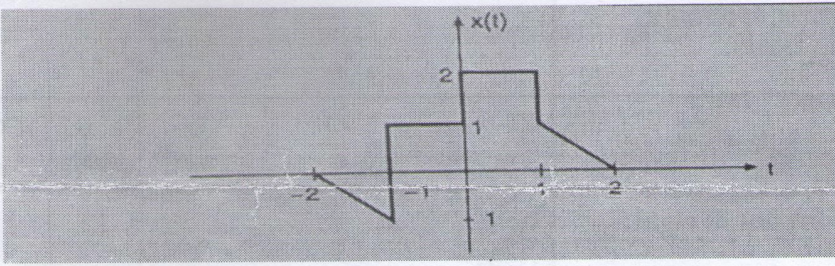
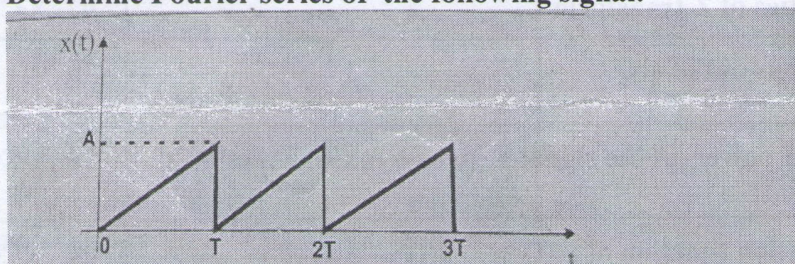
Max. Marks: 60

Instructions:

- (1) All questions are compulsory.
- (2) Draw neat diagrams wherever applicable.
- (3) Assume suitable data, if necessary.

		Max. Mark	CO	BT level
Q 1	Solve any six questions out of eight:	12		
i)	Define Discrete time step function and delta function.	02	CO1	U
ii)	State condition of periodic and non-periodic signal.	02	CO1	U
iii)	Determine cross-correlation for the sequence: $x_1(n) = [1, 2, 3, 4]$ and $x_2(n) = [3, 2, 1, 0]$ using Tabular method.	02	CO2	Ap
iv)	Define Energy spectral density and power spectral density.	02	CO2	U
v)	Write the exponential Fourier series representation of a periodic function $x(t)$ with period T_0 .	02	CO3	U
vi)	Write the Fourier transform of $A \sin \omega_0 t$.	02	CO4	U
vii)	Define Laplace Transform and Inverse Laplace Transform.	02	CO5	U
viii)	State any two properties of Z transform	02	CO6	U
Q.2	Solve any four questions out of six.	16		
i)	Determine energy and power of the signal is given by: $x(n) = \text{rect}[t/T_0]$	04	CO1	Ap
ii)	Compute Autocorrelation function of: $x(t) = e^{-5t} u(t)$	04	CO2	Ap
iii)	State any four properties of Fourier series.	04	CO3	U
iv)	Compute Fourier transform of following periodic signals: $x(t) = \cos(2\pi f_0 t) u(t)$	04	CO4	Ap

v) Determine Laplace Transform of following signal: 04 CO5 Ap
 $x(t) = e^{-at} \sin \omega t \cdot u(t)$

vi)	Find initial value $x(0)$ and final value $x(\infty)$ of given z transform: $X(z) = (2z^{-1}) / (1 - 1.8z^{-1} + 0.8z^{-2})$	04	CO6	Ap
Q.3	Solve any two questions out of three.	16		
i)	 <p>For the signal $x(t)$ depicted in figure. Sketch the signals: i) $x(t)$, ii) $x(t+6)$, iii) $x(3t)$, iv) $x(t/2)$.</p>	08	CO1	Ap
ii)	The differential equation of the LTI system is $[d^2y(t)/dt^2] + 3 [dy(t)/dt] + 2y(t) = x(t)$. Calculate output if input $x(t) = e^{-3t}u(t)$ is applied to system using Fourier transform.	08	CO4	Ap
iii)	Determine Laplace Transform of $x(t) = e^{-at}u(t) + e^{-bt}u(-t)$ where $a > 0, b > 0$ and sketch its ROC.	08	CO5	Ap
Q.4	Solve any two questions out of three.	16		
i)	Compute cross-correlation for the sequence $x_1(n) = [1, 2, 3, 4]$ and $x_2(n) = [3, 2, 1, 0]$ by using direct computation and tabular method.	08	CO2	Ap
ii)	<p>Determine Fourier series of the following signal:</p> 	08	CO3	Ap
iii)	<p>Determine Inverse z Transform of $X(z) = (1 - 2z^{-1}) / (1 - 7/12z^{-1} + 1/12z^{-2})$</p> <p>i) ROC : $z > 1/3$ ii) ROC : $z < 1/4$ iii) ROC : $1/4 < z < 1/3$.</p>	08	CO6	Ap
