

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Back), November-December 2015

B. Tech in Electronics & Communication Engineering, Semester V

(Common to Electrical Engineering)

Roll No.....

ECE505: ENGINEERING SIGNALS & SYSTEMS

Time: 3 hours

Max. Marks: 100

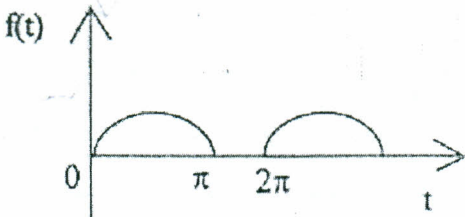
Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A	Objective type multiple choice questions (10 questions @ 1 mark)	10
i.	A periodic signal with period N_1 is added to another periodic signal of period N_2 . Then the resultant signal is always: (a) $N_1 + N_2$ (b) $N_1 N_2$ (c) $\text{LCM}(N_1, N_2)$ (d) $\text{HCF}(N_1, N_2)$	
ii.	If a system with input $\delta(n-1)$ convolved with $\delta(n+1)$, the output is: (a) $\delta(n-1)$ (b) $\delta(n-2)$ (c) $\delta(n)$ (d) $\delta(n+2)$	
iii.	The initial value of $\mathcal{L}^{-1} \left[\frac{s+1}{s(s+2)} \right]$ is: (a) 0 (b) ∞ (c) 1 (d) 0.5	
iv.	The Laplace transform of impulse $u(t)$ is (a) $1/s$ (b) s (c) $1/s^2$ (d) 1	
v.	The region of convergence of a causal finite duration discrete time signal is: (a) The entire z-plane except $z=0$ (b) The entire z-plane except $z=\infty$ (c) The entire z-plane except $z=0$ (d) The ring in z-plane	
vi.	The z-transform of the discrete-time signal $\delta(n-k)$: (a) z^{-n} (b) z^{-k} (c) $\frac{1}{z-n}$ (d) $\frac{1}{z-k}$	
ii.	Inverse Fourier transform of $u(\omega)$ is: (A) $\frac{1}{2} \delta(t) + \frac{1}{\pi t}$ (B) $\frac{1}{2} \delta(t)$ (C) $2\delta(t) + \frac{1}{\pi t}$ (D) $\delta(t) + \text{sgn}(t)$	
viii.	Define a causal system.	
ix.	Why Region of Convergence (ROC) cannot contain any pole?	
x.	If $x(t) \xrightarrow{\mathcal{F}} X(\omega)$, Then $\frac{dx(t)}{dt} \xrightarrow{\mathcal{F}} \dots \dots \dots$	

Q.2	Short answer type questions (4 questions @ 2.5 marks)	10
i.	Differentiate between time-variant and time-invariant systems.	
ii.	Sketch the following signals: (a) $u(t+5)$ (b) $\delta(t-1)$	
iii.	Determine whether the following signal is periodic or not: $x(t) = \sin(\sqrt{2}\pi t)$	
iv.	Write the Fourier transform of a signal $x(t) = e^{-3t}u(t)$.	

Q.3A	State and prove the following properties of continuous time Fourier series: (a) Time reversal (b) Frequency shift	05
Q.3B	Test the following system for linearity and time invariance: $y(n) = x(-n + 3)$	05

Q.4A	Determine the response $y(n) \geq 0$ of the system described by the difference equation $y(n) - 3y(n-1) - 4y(n-2) = x(n) - x(n-1) + 2$	05
Q.4B	Figure shows the graph for a half wave rectified sine wave. Obtain the exponential Fourier series expression. 	05

Q.5A	Determine and sketch the spectrum of $x(t) = 10\cos(10\pi t - \frac{\pi}{3})$	05
Q.5B	Find the convolution of the following signal by graphical method: $x(t) = e^{-3t}u(t)$; $h(t) = u(t+3)$	05

Q.6A	Determine the Fourier transform of the following signal: $x(t) = e^{-3t}u(t-2)$	05
Q.6B	Enlist the five properties of CTFT and prove time shifting property.	05
OR		
Q.6B	Enlist the five properties of Z-Transform and prove the time scaling property.	

Q.7A	Find the Inverse Fourier transform of $X(j\omega) = \frac{1}{(2+j\omega)^2}$	05
Q.7B	Determine the Laplace transform and associated ROC for the signal $x(t) = e^{-2t}u(t) + e^{3t}u(t)$	05
OR		
Q.7B	Find the inverse Laplace transform of $X(s) = \frac{1}{s(s+2)}$.	

Q.8	Find the inverse Laplace transform for the following: (a) $\frac{2s+5}{(s+2)(s+3)}$; ROC: $-3 < \sigma < -2$ (b) $\frac{1}{s^2-s-2}$; ROC: $\sigma > 2$	10
OR		
Q.8	The input and output of a causal LTI system are related by the differential equation $\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = \frac{dx(t)}{dt}$ (a) Find the impulse response of the system. (b) What is the response of this system if, $x(t) = u(t)$	

Q.9A	Determine the z-transform of (a) $x(n) = (0.5)^n u(n) + 2^n u(n)$ (b) $x(n) = u(n) - u(n - 10)$	10
Q.9B	Determine the inverse z-transform of $X(z) = \frac{1}{\left(1 - \frac{3}{2}z^{-1} + \frac{1}{2}z^{-2}\right)}$	10
	OR	
Q.9B	Using long division, determine the causal and non-causal sequence $x(n)$ for $X(z) = \frac{1 + z^{-1}}{1 - \left(\frac{1}{3}\right)z^{-1}}$	