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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2018

Program: B.Tech,ASE-A
 Subject (Course): Signals and systems
 Course Code : ELEG 201
 No. of page/s:3

Semester –IV
 Max. Marks : 100
 Duration : 3 Hrs

SECTION A

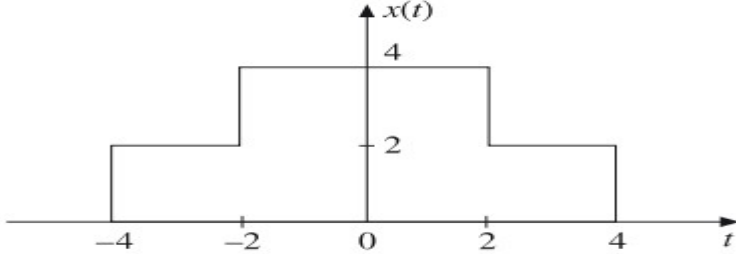
S. No.		Marks	CO
Q 1	(a) Is the sum of two periodic signals periodic? Justify the answer (b) sketch the signal $x(t)=t^2u(t)$ and determine whether it is energy signal or power signal.	[2+3]	CO1
Q2	Prove the time scaling property of continues time Fourier transform and hence find the Fourier transform of $x(t)=e^{-0.5t}u(t)$.	5	CO2
Q3	Perform the linear convolution of the input sequence $x(n)=\{2,-1,2,4\}$ and impulse response $h(n)=\{1,-2,4,-9\}$.	5	CO2
Q4	By applying the final value theorem of Z-transform, find $x(\infty)$ If $X(z)=\frac{2z+3}{(z+1)(z+3)(z-1)}$	5	CO3

SECTION B All questions are compulsory and carry equal marks.

Note: Attempt any one question from Qno 8 & Qno 9

Q5	Obtain the trigonometric Fourier series for the waveform shown in the below figure 1	10	CO2
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Figure 1

Q6	<p>A system is characterized by the differential equation $\frac{d^2 y(t)}{dt^2} + 5 \frac{dy(t)}{dt} + 6 y(t) = 2 x(t)$ solve for $y(t)$ for $t \geq 0$ when $x(t) = u(t)$, $y(0) = 2$ and $dy(0)/dt = 12$</p>	10	CO4
Q7	<p>Design a causal discrete-time LTI system with the property that if the input is $x(n) = (\frac{1}{3})^n u(n) - \frac{1}{5} (\frac{1}{3})^{n-1} u(n-1)$, then the output is $y(n) = (\frac{1}{2})^n u(n)$ determine the transfer function $H(Z)$, the impulse response $h(n)$ and the frequency response $H(e^{j\omega})$ of the system that satisfies the condition</p>	10	CO4
Q8	<p>(a) Distinguish between i) periodic and aperiodic signals ii) deterministic and random signals iii) Even and odd signals.</p> <p>(b) Find the inverse Fourier transform of $X(\omega) = \frac{j\omega}{\omega^2 + 1}$</p>	5+5	CO2
Q9	<p>Determine the Continuous time Fourier transform of the following signal shown in figure 2</p> <div style="text-align: center;">  </div> <p>Figure 2</p>	10	CO2
<p>SECTION-C 40 Marks</p> <p>Attempt any two questions and each carry equal marks.</p>			
Q10	<p>(a) A causal LTI system is described by the difference equation</p> $y(n) = x(n) + 0.81x(n-1) - 0.81x(n-2) - 0.45y(n-2)$ <p>Find the system function and frequency response of the system. Plot the poles and zeroes and indicate the ROC. Also determine the stability and impulse response of the system.</p> <p>(b) Find the Continuous time Fourier transform of the signal $x(t) = 5 \sin^2(3t)$</p>	13+7	CO4

Q11	<p>(a) Find the inverse Laplace transform of the following $X(s) = \frac{3s^2 + 22s + 27}{(s^2 + 2s + 2)^2}$</p> <p>(b) Find the DTFT of the following signals i) $x(n) = n3^{-n}u(-n)$ ii) $u(-n)$</p>	[12+8]	C05
Q12	<p>(a) Check whether the following systems are static/dynamic, causa/non-causal, time variant/time invariant</p> <p>i) $\frac{d^3 y(t)}{dt^3} + 2\frac{d^2 y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 2y^2(t) = x(t-1)$</p> <p>ii) $y(t) = at^2 x(t) + bt x(t+4)$</p> <p>(B) Prove that the sequence (a) $x(n) = a^n u(n)$ and (b) $x(n) = -b^n u(-n-1)$ have the same $X(Z)$ and differ only in ROC. Also plot their ROCs</p>	10+10	C02