Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EC202

Course Name: SIGNALS & SYSTEMS

Max. Marks: 100 Duration: 3 Hours

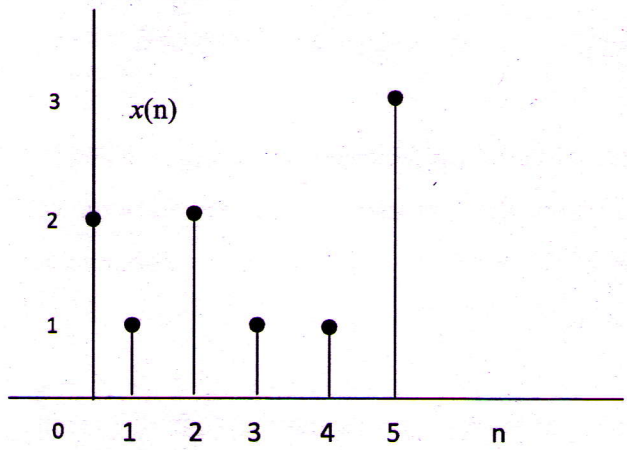
PART A

Answer any two questions

1 a) Observe the given signal and sketch the following: 2x3=6

(i) $y(n) = 2x(-2n+1)$

(ii) $z(n) = -x\left(\frac{n}{2} - 2\right)$



b) Compute the power and energy of the following signals and check whether they are power signals or energy signals 2x3=6

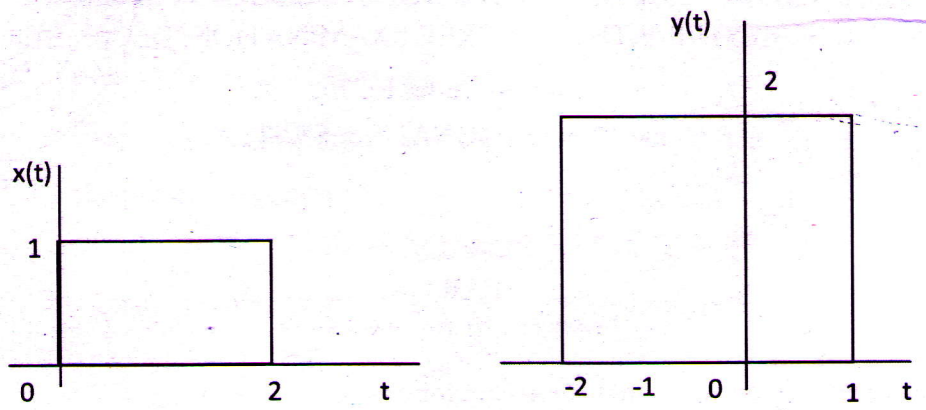
(i) $x(n) = \left(\frac{1}{3}\right)^n u(n)$

(ii) $y(t) = (1 + e^{-5t})u(t)$

c) Define, sketch and list the properties of continuous time impulse function. 3

OR

2 a) Find the convolution of the given signals and sketch the result: 9



b) Find the convolution of the following sequences using matrix multiplication method 6

$x(n) = \{1, -2, 3, 1\}$ $y(n) = \{2, -3, -2\}$

3 a) Show that any signal can be represented as the summation of an odd and an even signal. Write down the expression for the odd and even components of the signals $x(t)$ *and* $x(n)$. Find the odd and even components of the signal $x(n) = \{-2, 1, 2, -1, 3\}$ 7

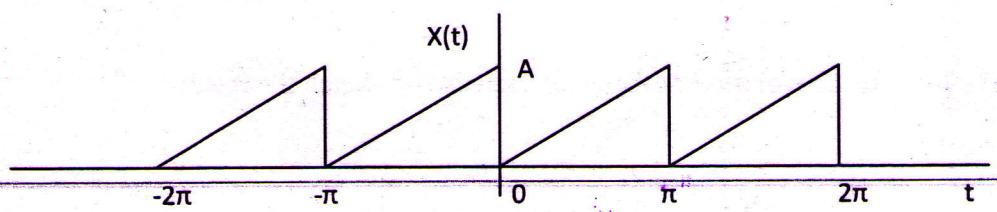
b) Find the convolution of the following signals and plot the result: 8

$$x(n) = \left(\frac{1}{3}\right)^{-n} u(-n-1) \qquad h(n) = u(n-1)$$

PART B

Answer any two questions

4 a) Obtain the fourier series representation of the given waveform. Plot magnitude spectrum. 8



b) Find the CTFT of the signal $x(t) = te^{-at}u(t)$ using an appropriate property. State and prove the property used. 7

5 a) Find the response of a system with transfer function $H(s) = \frac{1}{(s+1)(s+0.5)}$ for unit step input. 5

b) A causal LTI system is described by the relation 6

$$\frac{d^2y(t)}{dt^2} + 6\frac{dy(t)}{dt} + 8y(t) = 2x(t)$$

Find the impulse response of the system applying Fourier Transform

c) Obtain the transfer function of an ideal integrator in s domain. 4

6 a) Find the inverse Laplace transform of the following function: 5

$$X(s) = \frac{3s^2 + 8s + 6}{(s+2)(s^2 + 2s + 1)}, Re(s) > -1$$

b) Find the Fourier transform of unit step function 5

c) State and prove Parseval's theorem for Fourier series. 5

PART C

Answer any two questions

7 a) Show that Fourier transformof the signal 8

$$x(n) = sin\left(\frac{\pi n}{2}\right)u(n)$$

is given by $X(e^{j\omega}) = \frac{e^{-j\omega}}{1+e^{-j2\omega}}$

b) Find the z-transform and ROC of the following signals:

(i) $x(n) = a^{|n|}$; $|a| < 1$ 3

(ii) $y(n) = \frac{1}{2}n^2\left(\frac{1}{3}\right)^{n-1}$ u(n-1) 5

c) Prove that convolution in time domain is equivalent to multiplication in Z domain 4

8 a) Determine the impulse response of the following system using Fourier Transform method: $y(n) - \frac{1}{6}y(n-1) - \frac{1}{6}y(n-2) = x(n)$ 8

b) Plot the pole-zero diagram and asses the stability of the following system: 8

$$y(n) = y(n-1) - 0.5y(n-2) + x(n) + x(n-1)$$

c) Find the DTFT of the signal if z-transform is given by 4

$$X(z) = \frac{z}{(z-0.2)(z+0.9)}$$

9 a) A discrete time LTI system is characterised by the impulse response $h(n) = \left(\frac{1}{2}\right)^n u(n)$ Use Fourier transform to determine the response of the system to the input $x(n) = \left(\frac{3}{4}\right)^n u(n)$ 8

b) Determine the z-transform and plot the ROC of the signal starting from definition of z-transform 8

$$x(n) = a^n u(n) - b^n u(-n-1)$$

c) Establish the correspondence between s-plane and z-plane 4

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