

## FACULTY OF INFORMATICS

B.E. 2/4 (I.T.) II - Semester (Suppl.) Examination, January 2016

Subject : Signals and Systems

Time : 3 Hours

Max. Marks: 75

**Note: Answer all questions from Part - A and answer any five questions from Part-B.**

### PART – A (25 Marks)

- 1 Find the even and odd component of the signal  $x(t) = e^{jt}$ .
- 2 Determine whether the following signal is an energy signal or power signal  $x(t) = e^{-at} u(t)$ ,  $a > 0$ .
- 2 Sketch the following signal  $x(n) = -u(-n - 1)$ .
- 4 Given  $x(t) = \sin\left(\frac{2f}{3}t\right)$  determine whether the  $x(t)$  is periodic or not and if it is periodic determine its fundamental period.
- 5 Find the Fourier Transform of  $x(t) = \delta(t)$ .
- 6 Explain the significance of Region of convergence of Z- Transform.
- 7 Define impulse response of a system.
- 8 State the convolution property of Fourier Transform.
- 9 State the BIBO stability criterion.
- 10 Find the Z transform of  $x(n) = u(n)$ .

### PART - B (50 Marks)

- 11 (i) Find the inverse Fourier Transform  $X(\check{S}) = \frac{1}{(a + j\check{S})^2}$ . (6)
- (ii) Determine the complex exponential Fourier series coefficients for the signal  $x(t) = \cos 4t + \sin 6t$  (4)
- 12 (i) Determine the Laplace Transform of the signal  $x(t) = -e^{-at} u(-t)$ ,  $a$  being real and also determine its Region of convergence (ROC). (6)
- (ii) State and prove the Final Value theorem of Laplace Transform. (4)
- 13 (i) Find the ZT of the sequence  $x(n) = u(n)$  and plot its ROC (5)
- (ii) Find the inverse ZT of  $X(z) = \frac{1}{4(z-1)(z-\frac{1}{4})}$ , ROC :  $\{|z| > 1\}$  (5)
- 14 (i) State Nyquist Sampling Theorem (3)
- (ii) Determine the Nyquist sampling rate and Nyquist sampling interval for the signal  $x(t) = 2\text{sinc}(100\pi t)$  (7)

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- 15 (i) Solve the second order linear differential equation  
 $\ddot{y}(t) + 5\dot{y}(t) + 6y(t) = x(t)$  with the initial conditions  $y(0)=2$ ,  $y'(0)=1$  and  
 $x(t) = e^{-t}u(t)$ . (7)
- (ii) Check whether the following systems are Linear Time Invariant or not  
 (a)  $y(t) = x\left(\frac{t}{2}\right)$  (b)  $y(t) = x(t) + x(t-2)$  for  $t \geq 0$ . (3)
- 16 (i) Show that the product of two even signals or of two odd signals is an even signal  
 and that the product of an even and odd signal is an odd signal. (5)
- (ii) State and prove Parseval's theorem for Fourier Transform (5)
- 17 (i) Write the Matlab code for generating an exponential signal  $x(t) = 6e^{-at}$  for a  
 duration of 1 second. (5)
- (ii) Write the main features of the Matlab programming language. (5)

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