

**FACULTY OF INFORMATICS****B.E. 2/4 (I.T.) II - Semester (Old) Examination, May / June 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  
 $x(t) = \cos(t) + \sin(t) + \sin(t)\cos(t)$ .
- 2 Determine whether the following signal is an energy signal or power signal  
 $x(t) = 5\cos(\pi t) + \sin(5\pi t)$
- 3 Sketch the following signal  $x(t) = u(t+1) - 2u(t) + u(t-1)$ .
- 4 Given  $x(t) = \cos 2t + \sin 3t$  determine whether the following signal is periodic or not and if it is periodic determine its period.
- 5 State the Dirichlet's conditions for the existence of Fourier Transform.
- 6 Explain the significance of Region of convergence of Laplace Transform.
- 7 Define impulse response of a system.
- 8 Define convolution of two discrete time signals  $x(n)$  and  $y(n)$
- 9 State the BIBO stability criterion.
- 10 Find the Z transform of  $x(n) = \delta(n)$ .

**PART B (50 Marks)**

- 11 (a) Find the inverse Fourier Transform  $x(\omega) = \begin{cases} 2\cos\omega & |\omega| \leq f \\ 0 & \text{elsewhere} \end{cases}$  (5)
- (b) Determine the complex exponential Fourier series coefficients for the signal  $x(t) = 3\cos(4\omega_0 t)$ . (5)
- 12 (a) Determine the Laplace Transform of the signal  $x(t) = e^{-\alpha|t|}$  and also determine its Region of convergence (ROC). (6)
- (b) State and prove the Initial Value theorem of Laplace Transform. (4)
- 13 (i) Find the ZT of the sequence  $x(n) = \cos(\omega_0 n)u(n)$  and plot its ROC (5)
- (ii) Find the inverse ZT of  $x(z) = \frac{3}{(z-2)}$ , ROC:  $\{|z| > 2\}$ . (5)
- 14 (i) State Nyquist Sampling Theorem (3)
- (ii) Determine the Nyquist sampling rate and Nyquist sampling interval for the signal  $x(t) = 3\cos(2000\pi t) + 5\sin(6000\pi t) + 10\cos(12000\pi t)$  (7)

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- 15 (i) Check the stability of the following systems (5)  
(a)  $y(n)=ax(n-7)$  (b)  $h(n)=a^n$  for  $0 \leq n \leq 11$  (c)  $h(n)=2^n u(n)$
- (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  $t \geq 0$  (5)
- 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 a sinusoidal signal of amplitude 5 and frequency 10Hz for a duration of 1 second. (5)  
(ii) Write the main features of the Matlab programming language. (5)

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