

**FACULTY OF INFORMATICS****B.E. 2/4 (IT) II – Semester (Main) Examination, May / June 2015****Subject : Signals and Systems****Time : 3 hours****Max. Marks : 75****Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.****PART – A (25 Marks)**

- 1 What is a unit impulse or delta function? 2
- 2 Distinguish between continuous-time and discrete time signals. Give one example for each. 3
- 3 Define  $u_s(t)$  and prove that  $u_s(t) = 0.5 + 0.5 \operatorname{sgn}(t)$ . 3
- 4 Find the Fourier transform of  $x(t) = e^{-at} u_s(t)$ . 2
- 5 Given  $X(s) = \frac{s+2}{s(s+1)}$ , find  $x(t)$ . 3
- 6 Define a 'band limited' signal. 2
- 7 Find the z-transform of  $u(n)$ . 2
- 8 What is a quantizer? 2
- 9 When do you say a system is time-invariant? 3
- 10 Define BIBO stability. 3

**PART – B (50 Marks)**

- 11 a) Write 3 representations of Fourier series. Derive the relationship between their coefficients. 7
- b) Draw the waveforms obtained for the following equations. 3
  - i)  $u_s(t-1)$
  - ii)  $\delta(t+2)$
  - iii)  $u_s(t+2) - u_s(t-3)$
- 12.a) Prove that  $F\{x(at)\} = \frac{1}{a} X\left(\frac{W}{a}\right)$ , where 'a' is a positive number. 2
- b) Find  $x(t)$  when  $X(s) = L\{x(t)\} = \frac{s+2}{(s+4)(s+3)}$ . 5
- c) Sketch the signal 3
 
$$x(n) = 5\delta(n+3) + 4\delta(n+2) + 3\delta(n+1) + 2\delta(n) + \delta(n-1) + 0.5\delta(n-2) + 0.25\delta(n-3).$$
- 13 a) Define Nyquist frequency for a band limited signal. 2
- b) State and prove sampling theorem. 8
- 14 a) Determine which of the following signals are energy signals and which are power signals. 5
  - i)  $x(t) = e^{5t} u_s(t)$
  - ii)  $x(t) = \cos(4t) u_s t$ .
- b) Illustrate with an example the meaning of Zero Order Hold (ZOH). 5

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- 15 a) If  $z[x(n)]$  is  $X(z)$  prove that  $z[x(-n)]$  is  $X\left(\frac{1}{z}\right)$ . 5
- b)  $x(n) = \begin{cases} 0 & n \geq 0 \\ -b^n & n < 0 \end{cases}$  5  
Find the Z-transform and show ROC.
- 16 a) Define the following system properties 7  
i) Causal ii) linear  
b) Check whether the system  $y(n) = e^{x(n)}$  is linear or not. 3
- 17 Write a MATLAB program for  
a) Plotting 3 common functions 2  
b) Generating a square wave 3  
c) Applications of MATLAB 5

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