

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

..2..

- 15 a) If $z[x(n)]$ is $X(2)$ prove that $z[x(-n)]$ is $X\left(\frac{1}{2}\right)$. 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
