

**International Islamic University Chittagong**  
 Department of Electronics & Telecommunication Engineering  
 B. Sc. in ETE Semester Final Examination, Spring 2019  
 Course Code: ETE-2325, Course Title: Signal and Systems

Time: 2:30 Hour

Full Marks: 50

*[Answer any two questions from Part-A and any three questions from Part-B. The figures in the right margin indicate full marks]*

**Part A**

- 1.(a) What do you mean delta sequence of a signal? Graphically present the convolution  $y(t) = -e^{-at} * u(t)$ ; where  $a > 0$ . 5
- (b) The impulse response of the RC circuit depicted in the following Fig.1 is 5

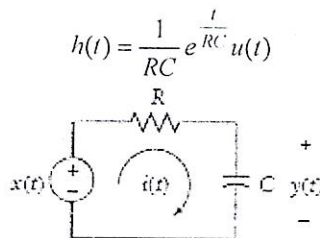


Fig.1: RC circuit system with the voltage source  $x(t)$  as input and the voltage measured across the capacitor,  $y(t)$ , as output.

- Find the step response of the circuit.
- 2.(a) Point out the following terms: 3
- i) Natural response
  - ii) Zero state response
- (b) Determine the forced response of the system described by the equation, 7
- $$5 \frac{dy(t)}{dt} + 10y(t) = 2x(t)$$
- for the input,  $x(t) = 2u(t)$
- 3.(a) Determine the Fourier series representation of the following discrete time signal. 3
- $$x(n) = 4 \cos \frac{\pi n}{2}$$
- (b) Perform and sketch the frequency spectrum of the following Fourier series representation of discrete time signal 7

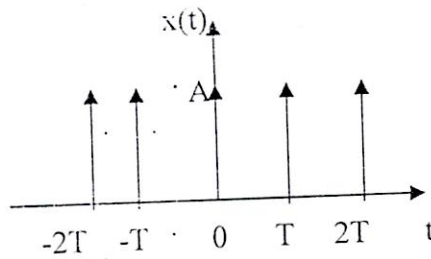
$$x(n) = \{ \dots, 1, 2, -1, \underset{\uparrow}{1}, 2, -1, 1, 2, -1, \dots \}$$

**PART B**

- 4.(a) Evaluate the time shifting and time reversal properties of Fourier transform. 5  
 (b) Determine the inverse Fourier transform of the following function using partial fraction expansion technique. 5

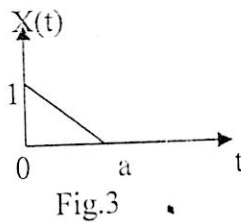
$$X(j\Omega) = \frac{3(j\Omega) + 14}{(j\Omega)^2 + 7(j\Omega) + 12}$$

- 5.(a) Find the inverse Laplace transformation of the following transfer function  $F(s) = 1/(s^2 + a^2)^2$ . 5  
 (b) Determine the Fourier transform of the periodic impulse function shown in the following Fig.2 5



- 6.(a) Explain the Amplitude scaling and Linearity properties of Laplace transform. 3  
 (b) Construct the Laplace transform of the following continuous time signals and their ROC 7
- i)  $x(t) = e^{-at} \sin \Omega_0 t u(t)$
  - ii)  $x(t) = e^{-at} u(t)$
  - iii)  $x(t) = e^{-3t} u(-t)$

- 7.(a) Make the Laplace transform of the signal shown in the following Fig.3 5



- (b) Determine the Laplace transform of the sine pulse shown in the following Fig.4 5

