

Marks scored:

KATHMANDU UNIVERSITY  
End Semester Examination [C]  
November, 2018

Level : B.E.

Year : IV

Exam Roll No. :

Time: 30 mins.

Course : COMP 407

Semester: I

F. M. : 10

Registration No.:

Date NOV 15 2018

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Select the most appropriate option.

1. The function  $f(x) = x^2 + 3$  is  
a. DC signal      b. Random Signal      c. Even Signal      d. Odd signal
2. The product of two even functions is an  
a. Even function      b. Odd function  
c. Random function      d. Deterministic function
3. For the system with input output relationship  $y[k] = 2x[k - 2]$ , the impulse response is  
a.  $3\delta[k - 2]$       b.  $\delta[k - 2]$       c.  $2\delta[k - 2]$       d.  $\delta[k - 1]$
4. If  $\alpha$  is zero in signal  $x(t) = e^{\alpha t}$ , then the output of the signal is  
a. exponential growing signal      b. exponential decaying signal  
c. sinc signal      d. dc signal
5. The fundamental period of signal  $\cos(4n)$  is  
a.  $\frac{\pi}{2}$       b.  $\frac{\pi}{4}$       c.  $4\pi$       d.  $2\pi$
6. If  $x[n] = \delta[n - 1] + 2\delta[n - 3]$  then  $x[n - 1]$  is .....  
a.  $2\delta[n - 2] + \delta[n - 4]$       b.  $\delta[n - 1] + 2\delta[n - 3]$   
c.  $\delta[n - 2] + 2\delta[n - 3]$       d.  $\delta[n - 2] + 2\delta[n - 4]$
7. While combined signal operation, if  $\alpha$  is negative in  $x[\alpha(t + \beta/\alpha)]$  then  
a. Signal is not flipped      b. Signal is reversed  
c. Signal is left shifted by  $\alpha$       d. Signal is right shifted by  $\alpha$ .
8. If the analog signal  $x(t) = \cos(4000\pi t)$  is sampled at the rate of  $F_s = 4000$  Hz. The discrete time signal obtained after sampling is  
a.  $\cos(4000\pi n)$       b.  $\cos(\pi n)$       c.  $4\cos(\pi n)$       d.  $2\cos(\pi n)$



KATHMANDU UNIVERSITY  
End Semester Examination [C]  
November, 2018

NOV 15 2018

Level : B.E.  
Year : IV  
Time : 2 hrs. 30 mins.

Course : COMP 407  
Semester: I  
F. M. : 40

SECTION "B"

[5Q × 8 = 40 marks]

Attempt ANY FIVE questions.

1. a. Discuss the advantages of Digital Signal Processing over Analog Signal Processing. [2]  
b. For the signal  $x[n] = 2 * |n|$ ;  $-2 \leq n \leq 3$  in graph and find [1 × 4 = 4]
  - i.  $x[n - 2]$
  - ii.  $x[3 - n]$
  - iii.  $x[2n]$
  - iv. Energy and Power of the signal
- c. Discuss the following terms: [1 × 2 = 2]
  - i. LTI Systems.
  - ii. Causal and Non-Causal System.

2. a. Discuss the use of Impulse train while sampling. [3]  
b. State and prove time shifting property of DTFT. [3]  
c. How circular convolution is different than linear convolution? [2]

3. a. Compute the circular convolution of following sequences [3]  
 $x[n] = \{0,1,2,3,1\}$  &  $h[n] = \{2,1,1,2\}$   
b. Use the butterfly diagram to compute 8-point DIT- FFT of the following [5]  
sequence using radix-2 decimation in time algorithm,  $x(n) = \{1/2, 1/2, 1/2, 1/2, 0,0,0,0\}$ .

4. a. Define Z Transform and Region of Convergence. Compute and find the Z-transform of [1+3]  
signal  $x[n] = (\frac{1}{2})^n u[n] - (\frac{1}{2})^n u[n - 10]$ .

- b. Find the Lattice Ladder Structure of the following system. [4]

$$H(z) = \frac{1 + 2z^{-1} + 2z^{-2} + z^{-3}}{1 + 0.928z^{-1} + 0.625z^{-2} - 0.33z^{-3}}$$

5. a. Explain the mapping relation between analog frequency and digital frequency in Impulse Invariant Method and Bilinear Transformation. [5]  
b. The transfer function of analog filter is  $H_a(s) = \frac{1}{(s+1)^2}$  with  $T = 0.1$  sec. [3]  
Design the IIR filter by using Bilinear Transformation.

6. a. Explain FIR filter design using rectangular window. How can ringing effect in Windows be reduced? [3+1]  
b. Design a digital low pass-filter with desired frequency response  $H_d(\omega)$  [4]  
provided below. Find the impulse response of FIR filter of length  $M=7$  satisfying the criteria using rectangular window defined by  $W[n]$ . Does the resulting filter have linear phase?

$$H_d(\omega) = \begin{cases} 2; & -\pi/4 \leq |\omega| \leq \pi/4 \\ 0; & \text{otherwise} \end{cases} \quad \& \quad W[n] = \begin{cases} 1, & 0 \leq n \leq 6 \\ 0, & \text{otherwise} \end{cases}$$

