UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

SECOND SEMESTER EXAMINATIONS, MAY, 2018

COURSE NO: CE 272
COURSE NAME: **SIGNALS AND SYSTEM**
CLASS: CE II TIME: 3 HOURS

Name**:** _____Index Number: _____

Instruction: ***Answer All questions in Sections A and B in your answer Booklet***

SECTION A [60 marks]

Fill in the spaces provided in this section.

1. If a signal depends on two independent variables, it is called …… signal
2. Examine whether the signal x(t) $sin12\pi t$ is periodic and state its fundamental period if it is periodic. ……. And …….
3. Examine whether the signal x[n] $sin5\pi n$ is periodic and state its fundamental period if it is periodic. ……. And …….
4. The representation of a signal by mathematical expression is known as ……..
5. Discrete-time signals are …… in time and ……. In amplitude
6. A unit step function cab be obtained by ……..a unit impulse function
7. A unit impulse function can be obtained by ……a unit step function
8. A signal which cannot be described by a mathematical equation is called……
9. For energy signals E = ……and P= ……
10. For power signals P = …….and E = …….
11. Time-Scaling of a signal $x(t)$ given by $x(2t)$ is known as ……
12. The discrete-time signal $x[n] = (-1)^n$ is periodic with fundamental period …….
13. Region of convergence of a causal LTI system is the ……..-half of s-plane.
14. The Nyquist Frequency for the signal x(t) =3 cos 50πt +10 sin 300πt – cos100πt …….
15. The period of the signal $x[n] = \cos(5\pi n)$ is ……..
16. Discrete time system is stable if the poles are within the unit ……..
17. Find the z transform of the finite sequence 1, 0, 0.5 is …….
18. If the output of a continuous time system depends only on the present input and not on the past or future input, the system is known as a …….

19. A system is called ……. if its present output depends on the present and past values of the input but not on the future values of input.
20. The Laplace transform of a unit step function is……..
21. A system having impulse response $h(t)$ will be BIBO stable if ……
22. The phenomenon called ……. occurs if the sampling frequency is less than the Nyquist rate.
23. For a bounded input $x(t)$ to a system, if the output $y(t)$ of the system is bounded, the system is called ……
24. State the two principles obeyed by all linear systems. …….. and ……
25. What are the 5 basic operations on discrete-timed signals? 1. ……2……. 3……4……..5……..
26. Derive the transfer function $H(s)$of the system characterized by the differential equation: $\frac{d^2y(t)}{dt^2} - \frac{dy(t)}{dt} - 2y(t) = x(t)$ ……
27. State the poles of the system in question 24. …….
28. Can every signal be decomposed into even and odd parts?
29. Write the expressions for deriving the even and odd parts for a signal in the discrete-time domain. 1 …… 2……
30. The property that states that a system that produces an output y[n] from input x[n] must produce an output ay[n] from ax[n] is called……
31. The range of values of z which for which x(z) converges is called…….
32. The ROC of the sum of two or more sequences is equal to the …….. of the ROCs of those sequences.
33. Define unit step function……..
34. Periodic signal is defined as……
35. The even and odd components of the signal $x[n] = \{-3,1,\underset{\uparrow}{2},-4,2\}$ are {…….} and {…….} respectively.

SECTION B

Instruction: Answer all questions in this section.

1)

a) Convolve x[n] = {1,3,3,1} and h[n] = {1,2,1} thus y[n] = h[n]*x[n]

b) Using the discrete-time signals $x_1[n]$ and $x_2[n]$ shown in figure 1, represent each of the following signals by a graph and by a sequence of number.

i) $y_1[n] = x_1[n] + x_2[n]$
ii) $y_2[n] = 2x_1[n]$
iii) $y_3[n] = x_1[n]\, x_2[n]$

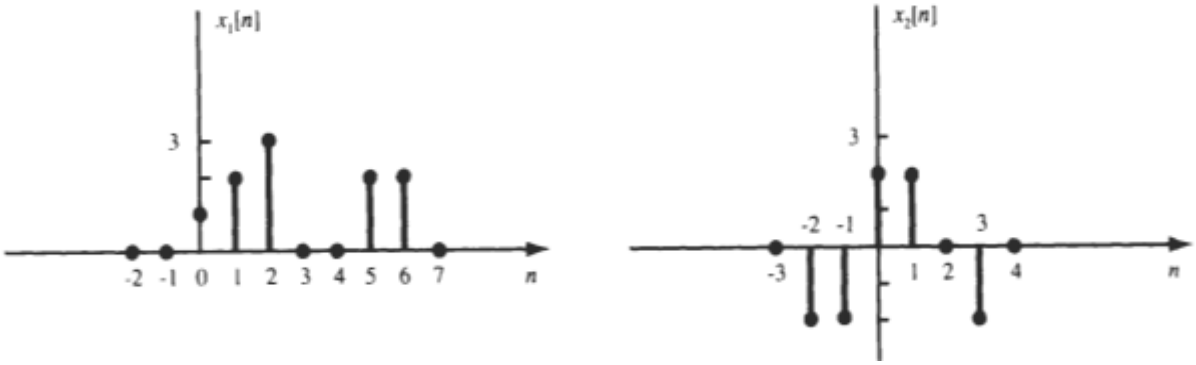

Figure 1

c) Consider the analog signal $X_a(t) = 3\cos 100\pi t$

i) Determine the minimum sampling rate required to avoid aliasing

ii) If the signal is sampled at F_s = 200Hz, what discrete-time signal will be obtained after sampling.

iii) If the signal is sampled at F_s = 75Hz, what discrete-time signal will be obtained after sampling.

iv) What is the frequency $0<F<F_s/2$ of a sinusoid that yields samples identical to those obtained in (iii) **[20 marks]**

2) Determine the *z*-transform and Laplace transform respectively for the following and state their respective ROCs:

a) f[n] = {1, 0, 0.5, 3}

b) $\frac{d^2y(t)}{dt^2} - \frac{dy(t)}{dt} - 2y(t) = 2x(t)$

c) State which of the following signals are causal or anti-causal with reasons.

i. $x(t) = e^{2t}u(t-1)$

ii. $x(t) = e^{-7t}u(-t+4)$

iii. $x(t) = 5\sin 6t$ u(2t)

iv. $x[n] = u(-n)$

v. $x[n]$ = u[n] – u[n-7]

[20 marks]

Examiner: E. Effah