UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

SECOND SEMESTER EXAMINATIONS, MAY 2015

COURSE NO : **CE 266**
COURSE NAME: **SIGNALS AND SYSTEMS**
CLASS : **CEL II** TIME: **3 HOURS**

Name: ……Index Number: ……..

INSTRUCTIONS: *Attempt **All** questions in SECTIONS A AND B*

Sections A, and B, are 40 marks and 20 marks respectively

Answer all questions in section A on the question paper

SECTION A

Answer All Questions in this SECTION by filling in the blank spaces for 1--16 indicating the correct answer in the options provided for 17--40.

Discrete and continuous	**All values of t**	**One dimensional**	**Signal modeling**
integrating	**Differentiating**	**Integrating**	**Digital signals**
x(t)	**Rational**	**Random**	**Discrete**
finite and Infinite	**deterministic**	**continuous**	**finite and zero**

1) If a signal depends on only one independent variable, it is called _____ signal.
2) The representation of a signal by mathematical expression is known as _____
3) Continuous time signals are defined for _____.
4) Discrete signals are _____ in time and _____ in amplitude
5) A signal that is discrete in time and quantized in amplitude is called _____.
6) A unit step function can be obtained by ____ the unit impulse function.
7) A unit impulse function can be obtained by ____ the unit step function.
8) A unit ramp function can be obtained by ____ the unit step function.
9) A signal which can be described by mathematical equation is called _____
10) A signal which cannot be described by mathematical equation is called _____
11) For the sum of two periodic signals to be periodic, the ratio of the periods must be a _____ number
12) In the case of _____-time signals, all sinusoidal signals are periodic
13) In the case of _____-time signals, not all sinusoidal signals are periodic
14) For an even signal x(-t) = _____ for all t
15) For an energy signal E = _____ and P= _____
16) For power signal P= ____ and E = ____
17) A signal can be represented in

a) Time domain b) Frequency domain

c) Both a and b d) None of the above

18) Analog signals can be converted into discrete signals by

a) Sampling b) Quantizing c) Coding d) None of the above

19) The fundamental period of a continuous-time complex exponential signal T_0 =

a) 2π b) $2\pi/\omega_0$ c) T d) $2\pi w$

20) Time-scaling a signal x(t) given by x(2t) is known as

a) Shrinking b) Enlargement c) Reversal d) Super-scaling

21) A system whose output depends on future inputs is a

a) Static system b) Non-causal system c) Dynamic system d) b) and c)

22) A non-anticipative system is a

a) Static system b) Causal system c) Non-causal system

23) Y[n] = x[n+2] is a

a) Linear system b) Dynamic system

c) Both linear and dynamic system d) None of the above

24) Y(t) = x(t-2) + 2x(t) is a _____ system

a) Causal b) Non-causal c) Both a) and b) d) None

25) The z-transform for a unit impulse sequence is

a) 1 b) 1/z c) 2 d) Z

26) If H(z) has ROC = R then reversing the time of the sequence H(1/z) produces (ROC) R* = ____

a) 1/R b) R c) 1/2R d) None

27) _____ system is a system whose output at any instant depends on the present value of its input.

a) Memory b) Memoryless c) Manual d) None

28) Radio signals from both FM stations and wireless access points are examples of _____ signals

a) Deterministic b) Random c) Both a and b d) None

29) Purely resistive electrical circuit is an example of _____ system

a) Static b) Dynamic c) Memory d) None

30) Summer or accumulator and electric circuits having inductors and or capacitors are examples of ___ system

a) Static b) memoryless c) Memory d) None

31) If an operator satisfies additivity or superposition and homogeneity (or scaling) conditions, then the operator is called a linear operator and the system represented by such an operator is called a _____

a) Non-linear system b) Causal system

c) Additive system d) linear

32) A system is called _____if a time shift (delay or advance) in the input signal causes the same time shift in the output signal.

a) time-invariant b) time-variant

c) linear d) non-linear

33) One property of ROC of z-transform is that it does not contain any poles

a) True b) False

10 The Laplace transform of a unit impulse function is

a) $\frac{1}{s}$ b) 1 c) $\frac{1}{s^2}$ d) S^2

34) The minimum sampling rate required for perfect reconstruction of a sampled signal at the receiver is known as Nyquist rate.
   a) True b) False
35) The sampling rule states that: Nyquist rate < $2F_{max}$ where F_{max} is the highest frequency component.
   a) True b) False
36) The phenomenon of aliasing occurs if the sampling frequency is less than the Nyquist rate.
   a) True b) False
37) A continuous-time linear system is BIBO stable if and only if its impulse response is absolutely integrable.
   a) True b) False
38) The Associative property of the convolution integral states that $x(t)*\{h_1(t)+h_2(t)\} = x(t)*h_1(t)+x(t)*h_2(t)$
   a) True b) False
39) Systems are functions that carry information, often in the form of temporal and spatial patterns.
   a) True b) False
40) Sampling an analogue signal having a maximum frequency of 2k requires that we sample at a frequency greater than 4k in order to preserve and recover the exact waveform.
   a) True b) False

Section B
Instruction: Answer all questions in this section

Q1.

a) For the Laplace transform X(s) of the continuous –time signal x(t) shown below,

$$X(s)=\frac{2s-4}{s^2+4s+3} \quad \text{Re}(s) > -1$$

Find:

i. scale factor
ii. Poles and zeros
iii. The region of convergence (ROC) of X(s) [6 marks]

b) State four systems' classifications [4 marks]

Q2.

a) Give four basic operations on signals [4 marks]

b) Examine whether the following signals are periodic or not. If periodic, determine the fundamental period.

i. $\sin 2\pi t$
ii. $\sin 10\pi t + cos 20\pi t$ [6 marks]

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