(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR

SUPPLEMENTARY/SPECIAL EXAMINATIONS
YEAR TWO SEMESTER ONE EXAMINATIONS

FOR THE DEGREE OF
BACHELOR OF SCIENCE COMPUTER SCIENCE

COURSE CODE : CSC 216.

COURSE TITLE : **DIGITAL AND ANALOGUE COMMUNICATION SYSTEM**

DATE: 20 / 12 /2022 **TIME:** 9.00 A.M. – 11.00 A.M.

INSTRUCTIONS TO CANDIDATES

ANSWER **QUESTIONS ONE** AND **ANY OTHER TWO.**

QUESTION ONE (COMPULSORY) [30 MARKS]

a) Discuss the following process in communication:
   i) Sampling (2 marks)
   ii) Quantization (2 marks)
   iii) Coding (2 marks)

b) Define sampling and state the sampling theorem (3 marks)

c) Distinguish the two angle modulation techniques (6 marks)

d) The instantaneous voltages of a modulating signal and carrier, in a certain DSB-FC AM scheme, are $25 \sin \omega_m t$ and $45 \sin \omega_m t$, respectively. Determine:
   i. the index of modulation (2 marks)
   ii. percentage modulation (1 marks)
   iii. the maximum amplitude of the resulting upperside band. (2 marks)

e) Define Pulse Amplitude Modulation (PAM) and state two demerits of PAM. (4 marks)

f) Discuss the Nyquist sampling theory and its important in communication. (4 marks)

g) Highlight two major advantages of using co-axial cable as a communication media (2 marks)

QUESTION TWO [20 MARKS]

a) Outline the limitations of baseband transmission (4 marks)

b) Explain the different phases of a digital communication system. Illustrate a block diagram (8 marks)

c) A certain input signal is given as $x(t) = \frac{1}{2\pi}\cos(4600\pi t)\cos(1200\pi t)$. Noting that $2\cos\omega_1 t \cos\omega_2 t = \cos(\omega_1 t + \omega_2 t) + \cos(\omega_1 t - \omega_2 t)$, calculate:
   i. the Nyquist rate (6 marks)
   ii. the Nyquist interval for the signal (2 marks)

QUESTION THREE [20 MARKS]

a) Discuss the sources and manifestation of the following types of noise in communication systems:
   i) Transit-time (3 marks)
   ii) Atmospheric noise (3 marks)
   iii) Extraterrestrial noise (3 marks)

b) A certain communication channel operates at 290 Kelvins with an input resistance of 15kΩ and a bandwidth of 0.8MHz. Taking Boltzmann's constant = 1.33×10^{-23} joule/kelvin, determine the:
   i. Power spectrum density (PSD) (3 marks)
   ii. average noise power, P_n (3 marks)
   iii. r.m.s. noise voltage at input. (3 marks)

c) A certain transmitting station has an antenna of height 80 metres. Determine the frequency that can be transmitted by such an antenna. (2 marks)

QUESTION FOUR [20 MARKS]

a) A 100MHz FM carrier frequency is modulated with a 6kHz sine wave. If the resulting frequency deviation is 15 kHz. Determine:

i. the carrier swing of the FM signal (2 marks)
ii. the highest frequency reached by the FM signal (2 marks)
iii. the lowest frequency reached by the FM signal (2 marks)
iv. the modulated index (2 marks)

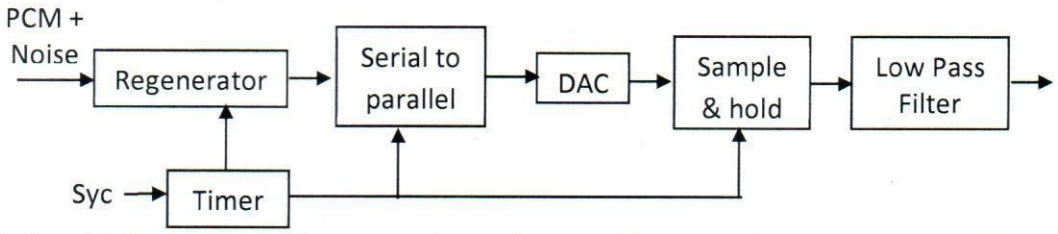
b) Discuss the details of the process listed below in generating a SSB modulation:

i) Suppression of carrier (4 marks)
ii) Suppression of unwanted sideband (4 marks)

c) Briefly discuss any two multiplexing techniques (4 marks)

QUESTION FIVE [20 MARKS]

a) Explain the function of each part in the blocks in the diagram above (12 marks)



b) Distinguish between a uniform quantizer and non uniform quantizer (2 marks)

c) Explain the basic working of a R/2R Digital-to-Analogue Convertor (DAC) (6 marks)