(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR

END OF SEMESTER 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: 16 /06 /2021 **TIME:** 09.00 A.M – 11.00 A.M

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO

QUESTION ONE [COMPULSORY] [30 MARKS]

a) Communication channels can be classified as either line communication or radio communication. Giving a suitable example of each and distinguish between the two classifications.

[4 marks]

b) Distinguish between external noise and internal noise. State how each one can be minimized.

[4 marks]

c) Distinguish between the multiplexing and demultiplexing. [4 marks]

d) Determine the average conversion time of a 12-bit ADC of the counter type for an input clock frequency of 1MHz [5 marks]

e) Using illustrative diagrams, discuss the following digital modulation techniques.

i. ASK [2 marks]

ii. PSK [2 marks]

iii. FSK [2 marks]

f) An amplifier operating over a frequency range from 650kHz to 660kHz has a 75kΩ input resistance at an ambient temperature of 15°C. Taking Boltzmann's constant=1.33×10^{-23} joule/Kelvin, determine:

i. The r.m.s. noise voltage at input [3 marks]

ii. Noise power [2 marks]

iii. Power spectrum density [2 marks]

QUESTION TWO [20 MARKS]

a) State three merits of SSB over DSB-FC modulation in AM (3 marks)

b) Distinguish the following AM techniques from each other

i. double sideband-suppressed carrier (DSB-SC) [2 marks]

ii. single sideband (SSB) [3 marks]

iii. vestigial sideband (VSB) [3 marks]

c) Use illustrative diagrams to describe the following modulation techniques:

i. Pulse Amplitude Modulation (PAM) [3 marks]

ii. Pulse Width Modulation (PWM) [3 marks]

iii. Pulse position Modulation (PPM). [3 marks]

QUESTION THREE [20 MARKS]

a) State two merits of digital modulation techniques: [2 marks]

b) Highlight the following digital modulation techniques:

i. Synchronous Time Division Multiplexing [2 marks]

ii. Asynchronous Time Division Multiplexing [2 marks]

c) With the help of block diagrams, explain Pulse Code Modulation [6 marks]

d) A certain radio station uses an FM carrier frequency of 100.5MHz that is modulated by 4kHz sine wave with a resulting frequency deviation of 35kHz. 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]

QUESTION FOUR [20 MARKS]

a) Outline five reasons for signal modulation [5 marks]

b) A radio station antenna transmits AM waves at 75kW of carrier power. Determine the total radiated power at 80% modulation? [4 marks]

c) Highlight effects of aliasing and name three ways aliasing can be eliminated. [4 marks]

d) Figure 1 shows a block diagram of a digital communication system. Highlight the function of each block. [7 marks]

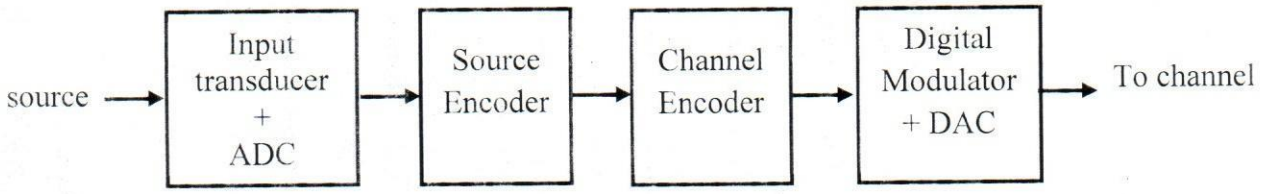

Figure 1

QUESTION FIVE [20 MARKS]

a) A certain digital signal is represented by the binary pulses 111001011000. Draw the resulting digital waveforms when the following line coding schemes are used:

i. On-off (RZ) [2 marks]

ii. Polar (RZ) [1 mark]

iii. Bipolar (RZ) [1 mark]

iv. On-off (NRZ) [2 marks]

v. Polar (NRZ) [1 mark]

b) Describe the working principle of a Digital-to-Analogue Convertor (DAC) shown in figure 2 below. [10 marks]

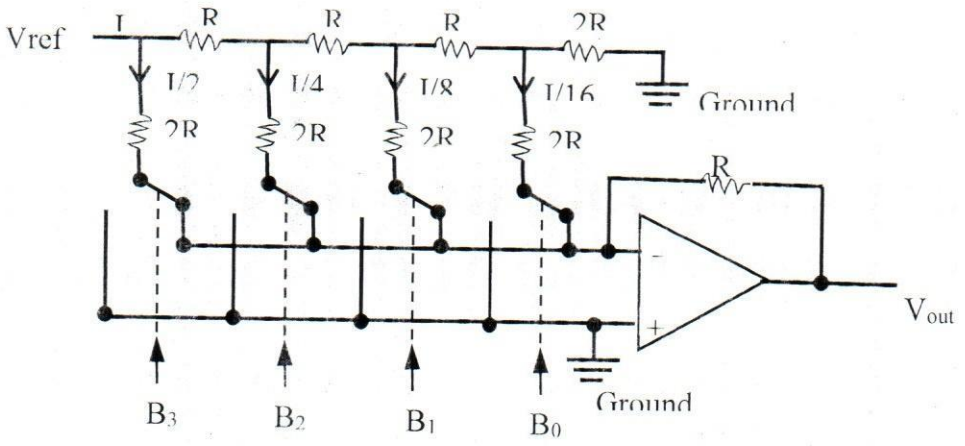

Figure 2

c) A certain communication device uses a transmitting antenna that is 5cm in length. Determine the frequency at with the device is able to transmit. Take the speed of light to be 2.998×10^8 ms^{-1}. [3 marks]