ZIMBABWE

MINISTRY OF HIGHER AND TERTIARY EDUCATION, INNOVATION, SCIENCE AND TECHNOLOGY DEVELOPMENT

HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

NATIONAL CERTIFICATE

IN

ELECTRONIC ENGINEERING: ELECTRONIC COMMUNICATION SYSTEMS

MODULE: Fundamentals of Electronic Communication

PAPER NO: 323/22/M02

DURATION: 3 hours

MAY/JUNE 2024 EXAMINATION

REQUIREMENTS

1. Answer booklet
2. Non-programmable calculator

INSTRUCTIONS TO CANDIDATE

1. Answer all questions.
2. Each question carries 10 marks.

PAPER NO: 323/22/M02 – FUNDAMENTALS OF ELECTRONIC COMMUNICATION

QUESTION 1

a) Explain the difference between analogue and digital waveforms. (4 marks

b) Using sketches show the waveforms and state where they are used:

i) Pulse waveform (2 marks)
ii) Saw tooth waveform (2 marks)
iii) Spicky waveform (2 marks)

QUESTION 2

a) State the relationship of frequency, wavelength and velocity. (3 marks)

b) i) Draw a sinusoidal signal and indicate its amplitude, period and wavelength. (3 marks)

ii) State the relationship between frequency and period of a waveform. (1 mark)

c) State the sound frequency range of the following:

i) Commercial speech (1 mark)
ii) Human voice (1 mark)
iii) Music (1 mark)

QUESTION 3

a) Define the word transducer. (2 marks)

b) Mention one (1) type of:

i) Input transducer (1 mark)
ii) Output transducer (1 mark)

c) What is a plasma display. (2 marks)

d) Using a diagram, explain the operation of the moving coil landspeaker. (4 marks)

QUESTION 4

a) Define a filter circuit. (2 marks)

b) Draw the block symbols and the gain/attenuator curves of the following:

i) High pass filter (2 marks)
ii) Band pass filter (2 marks)

c) Explain the following terms as applied to filter circuits:

i) Resonance (2 marks)
ii) Q-factor (2 marks)

QUESTION 5

a) Define the following terms:

i) Attenuation (1 mark)
ii) Noise (1 mark)

b) What is an attenuator? (2 marks)

c) Define noise figure, F. (2 marks)

d) An amplifier is operating over the frequency range 22 to 24mHz. The input resistance to the amplifier is 10kΩ and the amplifier is operating at an ambient temperature of 27°C, calculate the *rms* noise voltage at the input of the amplifier ($k = 1.38 \times 10^{3s} J/K$). (4 marks)

QUESTION 6

a) Explain the following types of noise:

i) Thermal noise (2 marks)
ii) Short noise (2 marks)
iii) Intermodulation noise (2 marks)

b) Calculate the power gain in decibels if the input is 1mW and the output is 1W. (4 marks)

QUESTION 7

Differentiate between class A, class B and class AB power amplifiers in terms of:

a) Operating (Q) point allocation (3 marks)

b) Output versus input signal voltages (3 marks)

c) Distortion (2 marks)

d) Efficiency (2 marks)

QUESTION 8

Define the following:

a) Amplitude modulation (2 marks)

b) Phase modulation (2 marks(

c) Pulse modulation (2 marks)

d) Pulse code modulation (2 marks)

e) Frequency modulation (2 marks)

QUESTION 9

a) An FM signal has a resting frequency of 107MHz and a highest frequency of 107.05MHz when modulated by a signal of frequency 8KHz. Determine:

i) Carrier swing (2 marks)
ii) Modulation index (1 mark)
iii) Lowest frequency reached (1 mark)

b) i) State any three (3) reasons for modulation in communication systems. (3 marks)

ii) The total power dissipated by an amplitude modulated wave is 1750W. Calculate the power in the side frequency if the modulation index is 60%. (3 marks)

QUESTION 10

a) Use sketches to illustrate the following processes:

i) Pulse – amplitude modulation (2 marks)
ii) Pulse – position modulation (2 marks)
iii) Pulse – time (duration) modulation (2 marks)

b) Compare AM and FM in terms of output power and bandwidth. (4 marks)

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