



(KNOWLEDGE FOR DEVELOPMENT)

KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2019/2020 ACADEMIC YEAR**

**END OF SEMESTER EXAMINATIONS
YEAR FOUR SEMESTER TWO**

**FOR THE DEGREE OF
COMPUTER SCIENCE**

COURSE CODE : CSC 455E

COURSE TITLE : DIGITAL AUDIO TECHNOLOGY

DATE: 10/11/2020

TIME: 2.00 P.M – 4.00 P.M

INSTRUCTIONS:

ANSWER QUESTIONS ONE AND ANY OTHER TWO

QUESTION ONE [COMPULSORY] [30 MARKS]

- (a) i) What is an audio signal? [2 marks]
- ii) Digitization of audio signal involves two main steps, sampling and quantization. Briefly describe two steps [6 marks]
- (b) State and explain the roles of four common audio processors in digital audio systems [8 marks]
- (c) Briefly explain the Nyquist theorem concept as applied in digital audio signal processing [4 marks]
- (d) Define the following terms [8 marks]
- (i) Bit depth
 - (ii) Quantization error
 - (iii) Critical band
 - (iv) Auditory perception
- (e) State three forms of audio coding formats and briefly describe each format [2 marks]

QUESTION TWO [20 MARKS]

- (a) Differentiate between microphones and loudspeakers and briefly describe three characteristics for each case [5 marks]
- (b) In reference to data compression for digital audio systems, briefly describe and differentiate the following coding methods
- i. Run Length Coding for Binary Files [3 marks]
 - ii. Huffman coding [3 marks]
 - iii. Arithmetic Coding [3 marks]
- (c) Briefly describe the following three forms of audio coding file formats in digital audio systems
- i. Waveform Audio File Format [2 marks]
 - ii. AU File Format [2 marks]
 - iii. RealAudio [2 marks]

QUESTION THREE [20 MARKS]

- (a) What is digital audio broadcast? [2 marks]
- (b) In Pulse Code Modulation, state three problems associated with uniform quantization [3 marks]
- (c) Illustrate using block diagrams the basic element of the PCM system from the transmitter, transmission path to the receiver and vice versa [4 marks]
- (d) State four advantages of Pulse Code Modulation [4 marks]
- (e) Differentiate between Adaptive Differential Pulse Code Modulation and Delta Modulation techniques and state their application in each case [4 marks]
- (f) In Dolby DTS, Direct Stream Transfer is a very complex coding method that uses three stages. List the three stages adopted by Dolby DTS [3 marks]

QUESTION FOUR [20 MARKS]

- (a) Differentiate between fundamental waveform and harmonics and illustrate harmonics in schematic form up to the 4th harmonic [6 marks]
- (b) Discuss the following methods of sound synthesis
- i. Additive synthesis [1 mark]
 - ii. Non-Linear Synthesis [1 mark]
 - iii. FM Synthesis [1 mark]
 - iv. Wavetable Synthesis [1 mark]
- (c) Explain the following terms applicable in audio production
- i. Acoustics [1 mark]
 - ii. Absorption [1 mark]
 - iii. Reverberation [1 mark]
 - iv. Depth perception [1 mark]

- (d) Discuss three reflection issues for room design to achieving good acoustics in a concert hall or studio [6 marks]

QUESTION FIVE [20 MARKS]

- (a) Sound can be described in two ways, by their frequency and by their intensity. Differentiate between the two [4 marks]
- (b) Explain the following terms as pertains to nonlinear synthesis of sound
- i. Wave shaping [3 marks]
 - ii. Phase distortion [3 marks]
- (c) State the meaning of auditory human perception and briefly describe the range of human hearing [4 marks]
- (d) Explain the term of “depth perception” with regard to human auditory perception [2 marks]
- (e) Discuss the concept of Internet Radio Broadcast and its applications [4 marks]