



MACHAKOS UNIVERSITY

University Examinations for 2017/2018

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR BACHELOR OF
SCIENCE IN COMPUTER SCIENCE

SCO 407: MULTIMEDIA TECHNOLOGIES

DATE: 11/12/2017

TIME: 8.30-10.30 AM

INSTRUCTIONS: Answer Question ONE and any other TWO Questions

QUESTION ONE (30 MARKS)

- a) **Explain** the main *advantages* of multimedia systems. (4 marks)
- b) In terms of computing, explain Four fundamental multimedia attributes (4 marks)
- c) Explain the forces driving the multimedia revolution (4 marks)
- d) Distinguish the following terms Hue, Saturation, Brightness and Luminance (4 marks)
- e) JPEG 2000 is a wavelet based image compression, explain its capabilities (4 marks)
- f) Briefly describe, using a suitable diagram, the MPEG-1 audio compression algorithm (6 marks)
- g) Define *chroma subsampling*? What is the benefit of performing *chroma subsampling* in image/video data compression and why is it an *appropriate approach* to take? (4 marks)

QUESTION TWO (20 MARKS)

- a) Describe the differences between data hiding, watermarking, and steganography. What are their respective applications and requirements? Is one a special case of another? (6 marks)
- b) The following are some possible applications of watermarking. Describe what they are and their requirements. (8 marks)
 - i. Ownership assertion
 - ii. Fingerprinting

- iii. Copy prevention and control
 - iv. Detection of unauthorized alteration (authenticate integrity of the data)
- c) i What is steganography? (2 marks)
- ii What are the design objectives for a steganography system? (4 marks)

QUESTION THREE (20 MARKS)

- a) i What is steganalysis? (2 marks)
- ii What are the design objectives for a steganalysis system? (4 marks)
- iii What are the two types of steganalysis techniques? (4 marks)
- b) i What is the key difference between I-frames, P-frames and B-frames in MPEG-2 video compression? (6 marks)
- ii What is MIDI?. What features of MIDI make it suitable for use in the MPEG -4 audio compression standard? (4 marks)

QUESTION FOUR (20 MARKS)

- a) State Nyquist's Sampling Theorem (2 marks)
- b) What general considerations affect the selection of the sampling rate in multimedia data? (4 marks)
- c) For each of the following media types: audio, graphics, images and video, briefly discuss how sampling affects the quality of the data, the cause of sampling artefacts, and the form in which they manifest themselves in the each data modality. (9 marks)
- d) Explain briefly why JPEG compression is not always suitable for compression of images that contain sharp edges or abrupt changes of intensity (such as black text on a white background). (5 marks)

QUESTION FIVE (20 MARKS)

- a) Explain the **Huffman Coding** Algorithm. (4 marks)
- b) Compare and contrast between the **JPEG2000** and **JPEG** standards. (6 marks)
- c) How does the human eye sense colour? What characteristics of the human visual system can be exploited for the compression of colour images and video? (4 marks)
- d) When performing lossy audio encoding there is a trade-off between the amount of space used and sound quality. Describe the **MPEG approach** to *lossy audio compression*. (6 marks)