

C11-R3: MULTIMEDIA TECHNOLOGY AND VIRTUAL REALITY

NOTE:

1. Answer question 1 and any FOUR questions from 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours

Total Marks: 100

1.

- a) What is temporal redundancy in video encoding?
- b) What is the difference between “lossless” and “lossy” compression?
- c) What is aliasing in sampled images? How can aliasing be avoided?
- d) Explain how MPEG-1 and MPEG-2 improve on the video compression rates that can be achieved by compressing each frame as a JPEG.
- e) What are the characteristics of the Internet Protocol (IP), which enable it to facilitate the interconnection of heterogeneous networks? How do these characteristics fit with the needs of real time multimedia applications?
- f) What is RAID technology and what advantages does it offer as a medium for storage and delivery of large data?
- g) A VRML file is a textual description of a 3D world or object. Valid VRML files begin with a header. Comments are used in VRML file to document the structure and logic.
 - i) Write an example of a VRML header.
 - ii) Write an example of a VRML comment.

(7x4)

2.

- a) Describe H.263 coding process with an example. What is the difference between H.263 code and H.261 code?
- b) Explain, why ATM data transfer mode is suitable for multimedia communication.

(9+9)

3.

- a) What is the difference between inter-object and intra-object synchronization.
- b) Construct a Huffman binary tree using the given a set of **symbols** with a list of relative **probabilities** of occurrence within a message.

m0	m1	m2	m3	m4
0.10	0.36	0.15	0.2	0.19

- c) Show how you would encode the following token stream using zero length suppression and run length encoding:

ABC000AAB00000000DEFAB00000

(4+8+6)

4.

- a) Why is TCP not suitable for real-time traffic? How does RTP overcome the limitation of TCP for real-time traffic? Also comment on quality of service guarantees in RTP.
- b) Why is DCT computed on small blocks (of 8x8 or 16x16) instead of on the whole images?
- c) Why is multicasting relevant to multimedia traffic? At what level in the networking stack would it be appropriate to facilitate multicasting for time sensitive traffic and why?

(8+4+6)

5.

- a) Explain what is meant by sample rate and sample length in the context of digitizing sound. Describe what the dynamic range of a sound means. Discuss the relationship between sample length and dynamic range.
- b) What is frequency masking and temporal masking? What does MPEG Layer 3 (MP3) audio do differently from Layer 1 in order to incorporate temporal masking?
- c) What are the problems faced in integrating multimedia data and how are these overcome?

(6+6+6)

6.

- a) Describe properties that make Virtual Reality a usable tool for training/entertainment etc.
- b) In immersive Virtual Reality (VR) systems, stereoscopic Head Mounted Displays (HMDs) can help to give the appearance of looking at a 3D world, by tracking the users head movements and rendering the appropriate views to the left and right eyes. In what ways is a user likely to be able to distinguish the virtual scene from the real world?
- c) Outline the different techniques that can be used for tracking user movements in VR applications, and compare their benefits and limitations.

(6+6+6)

7.

- a) Define multimedia, hypertext and hypermedia. How are these related?
- b) Explain the role of a Multipoint Control Unit (MCU) in relation to a video conferencing session involving multiple geographically distributed video conferencing studios.
- c) What is MHEG and give one application of MHEG.

(6+9+3)