CARDIFF UNIVERSITY
EXAMINATION PAPER

Academic Year:	2003-2004
Examination Period:	Postgraduate
Examination Paper Number:	CMP632
Examination Paper Title:	Multimedia Systems
Duration:	2 hours

Do not turn this page over until instructed to do so by the Senior Invigilator.

Structure of Examination Paper:
There are **THREE** pages.
There are **FOUR** questions in total.

There are **NO** appendices.

The maximum mark for the examination paper is 100% and the mark obtainable for a question or part of a question is shown in brackets alongside the question.

Students to be provided with:
The following items of stationery are to be provided:
One answer book.

Instructions to Students:
Answer THREE questions.

The use of translation dictionaries between English or Welsh and a foreign language bearing an appropriate departmental stamp is permitted in this examination.

1. (a) Give a definition of a Multimedia System. [2]

   (b) What are the key characteristics of a Multimedia System? [4]

   (c) Briefly describe eight hardware or software features that a Multimedia System should possess. [4]

   (d) The main types of multimedia data are: graphics, images, audio, and video. What technical issues are associated when these data types are integrated in a Multimedia System?

   For each media type briefly relate to the issues involved in generating, capturing, storing and transmitting the respective media components. [14]

2. (a) What does *Nyquist's Sampling Theorem* state? [2]

   (b) What are the implications of *Nyquist's Sampling Theorem* for multimedia data? [4]

   (c) For each of the following media types, *graphics*, *images*, *audio* and *video*, briefly discuss how *Nyquist's Sampling Theorem* affects the quality of the data and the form in which sampling effects manifest themselves in the actual data. [12]

   (d) Calculate the uncompressed digital output if a video signal is sampled using the following values:

   25 frames per second
   160 x 120 pixels
   True (Full) colour depth

   [3]

   (e) If a suitable stereo CD quality audio signal is included with the video signal in part d what compression ratio would be needed to be able to transmit the signal on a 128 kbps channel? [3]

3. (a) What characteristics of the human visual system can be exploited in relation to the compression of colour images and video?

[5]

(b) What is the *YIQ color model* and why is this an appropriate color model used in conjunction with compression methods such as JPEG and MPEG?

[4]

(c) Given the following YIQ image values:

128	126	127	129
124	123	124	124
130	136	132	132
154	143	132	132

Y

55	66	54	54
56	57	56	56
45	56	58	49
34	36	39	37

I

44	44	55	55
44	44	55	55
34	34	36	35
35	35	34	34

Q

What are the corresponding *chroma subsampled* values for a

(i) 4:2:2 subsampling scheme
(ii) 4:1:1 subsampling scheme
(iii) 4:2:0 subsampling scheme

[15]

4. (a) What is the distinction between *lossy* and *lossless* data compression?

[2]

(b) Briefly describe two repetitive suppression algorithms and give one practical use of each algorithm.

[10]

(c) Briefly state the LZW compression algorithm and show how you would use it to encode the following stream of characters:

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MYMEMYMO
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You may assume that single character tokens are coded by their ASCII codes, as per the original LZW algorithm. However, for the purpose of the solution you may simply output the character rather than the ASCII value.

[12]