BITS, Pilani – Dubai, Dubai International Academic City
IV Year   Second Semester   2007-2008
Degree: B.E. (Hons.)   Branch: C.S./E.I.E.
Comprehensive Examination Question Paper
Course No : EA UC473   Course Title: Multimedia Computing

Date: 25/05/08   Time: 10 am – 1 noon   Total marks: 80
Weightage: 40% Data provided are complete. *Closed Book*.
This question Paper has 2 pages.

Answer all questions.

1. Draw the **diagrams** for INTERACTIVE TELEVISION application using **cable distribution network** and **satellite/terrestrial broadcast network**.   [5 marks]

2. Draw the **QUICKTIME Architecture** Diagram and explain its various components and their functions.   [5 marks]

3. Write a brief Technical Note on Haptic Displays & Auditory Displays.
                                                    (2.5+2.5 marks)

4. Consider the transmission of a message comprising a string of characters. The probabilities of each character is given below:

$p(A)=0.10$ $p(M) = 0.15$ $p(R) = 0.20$ $p(S) = 0.25$ $p(T)=0.30$
   Using ARITHMETIC CODING,
   a) Encode the string **ARTS**
   b) Decode 0.4051 [into a 4 letter string]   [5+5 marks]

5. The following **intensity values** in an image are to be transmitted using HUFFMAN CODING:

140	60	40	30	4	3	0	0
70	48	30	3	4	1	0	0
50	48	4	4	2	0	0	0
40	4	5	5	1	0	0	0
5	4	30	0	0	0	0	0
3	2	3	0	0	0	0	0
1	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Construct the HUFFMAN Coding Tree step by step for the above intensity values present in the above image and *determine* the number of bits required to code each intensity value.   [7 M]

6. Explain in brief the following w.r.t. Compact Disk Digital Audio (CD-DA):
   a) Eight-to-Fourteen Modulation
   b) Areas: *Lead-In, Program and Lead-Out.*   [2.5+2.5 marks]

7. Draw the diagram showing the GRANULARITY of a motion picture sequence
[uncompressed video].   [2 marks]

8. What approaches are used for the *transmission* of *animation* over
computer networks ?   [2 marks]

9. Draw the diagram corresponding to the AUDIO STREAM in MPEG. [2 marks]

10. Explain the functions performed by components of a
                         MIDI Synthesizer device.   [5 marks]

  1. Explain DITHERING & ANTI-ALIASING in images.   [4 marks]

12. Give an example for a heterogeneous multimedia query. [2 marks]

13. Explain the principles and mechanisms for DIRECT MANIPULATION in
multimedia user interface. [5 marks]

14. Discuss in brief the **Behavior** Class w.r.t. MHEG (multimedia and hypermedia
information coding experts group) Class Hierarchy. [2 marks].

15. What are the different modes in JPEG?   [2 marks]

16. Discuss LIP Synchronization Requirements w.r.t. a speaker in a TV news
environment and show with a rough sketch the following:
   Detection of Sync. Errors (% detected errors vs. skew in head, shoulder and body
views)   [10 marks]

17. Briefly outline the basic functions of **D-FRAME** in MPEG-1 VIDEO.
                                                     [3 Marks]
18. Explain the basic principles w.r.t. GIF (graphic interchange format) compression.
                                                     [4 marks]

2

BITS, Pilani – Dubai, Academic City, Dubai.
IV Year   SECOND SEMESTER   2007-2008
Degree: B.E. (Hons.) Branch: C.S. / E.I.E.
TEST II Question Paper
Course No : EA UC473   Course Title: Multimedia Computing
Date: 20, April, 2008 Sunday   Time: 50 min.   Total marks: 20
Data provided are complete. **OPEN** *Book*.
Text Books and Student's own handwritten class notes permitted.
This question paper has two pages and Figure 3.17

Answer all Questions.

1. The following problem relates to the dimensions of a compressed image using JPEG format:

You are given the following data: $X\_max = 512$ pixels ; i.e. the maximum of all X_i.
$Y\_max = 256$ pixels; i.e. the maximum of all Y_i.
$H\_max = 4$ i.e. Maximum Horizontal sampling ratio.
$V\_max = 4$ i.e. Maximum Vertical sampling ratio.

Now calculate **(X_i, Y_i)**   for each of the following pairs of (H_i, V_i)

H_i	V_i	X_i	Y_i
2	1		
4	1		
2	4		
1	2		

Here, (H_i, V_i) refer to relative horizontal and vertical sampling ratio for each component .   [2 marks]

2. Consider the transmission of a message comprising a string of characters. The probabilities of each character is given below:

$p(A) = 0.15$ $p(E) = 0.20$ $p(M) = 0.25$ $p(Z) = 0.40$
Using ARITHMETIC CODING,
   a) Encode the string **MAZE**
   b) Decode 0.6390 [into a 4 letter string]   ]3+3 marks]

3. Mention *2 practical applications (i.e. 2 real time examples)* for **each** of the following w.r.t. Synchronization in multimedia systems:
a) Content Relations b) Spatial Relations c) Temporal Relations. [3 marks]

P.T.O.

4. Find SSD [sum of squared differences] correlation and SAD [sum of absolute differences] correlation for the following data pertaining to MPEG P-Frames:

MATCH WINDOW [macro-block]				SEARCH WINDOW			
7	9	5	8	6	10	5	9
5	4	7	6	4	5	7	6
9	8	9	2	10	7	10	3

[3M]

5. What are the major influencing factors in LIP Synchronization ? [2 M]

6. Answer the following w.r.t. **JPEG**:
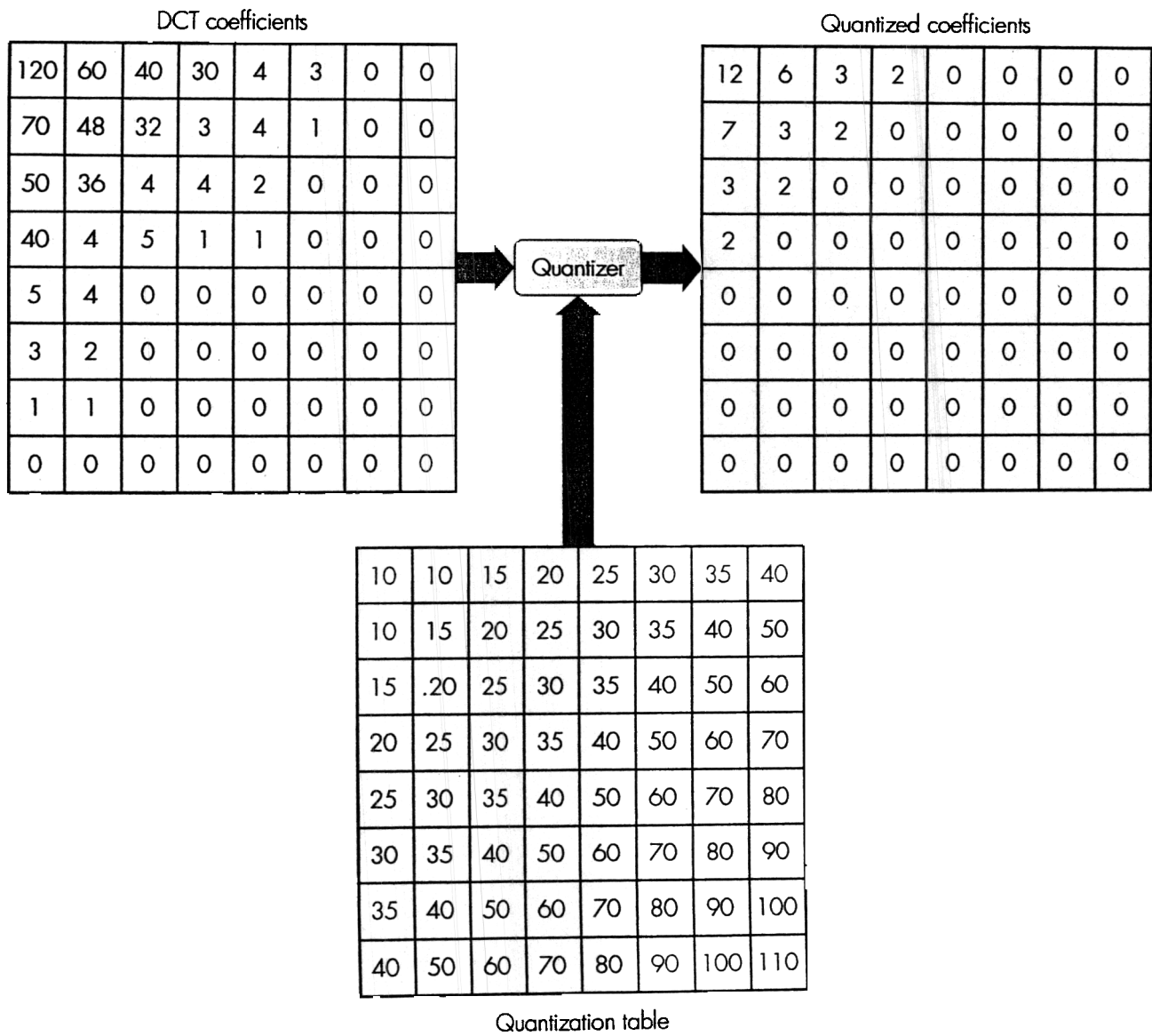   a) A ----------------------------------- has at most ten data units.   [0.5]
   b) Perform a ZIG ZAG SCAN on QUANTIZED COEFFICIENTS in Fig. 3.17 and write down the linearized vector [1 dimensional array].   [1.5 M marks]

7. What are the functions of I-Frames, B-Frames and P-Frames in MPEG-1 standard ?
   Which type achieves the highest compression and which type achieves the lowest compression [2 marks]

2

Figure 3.17 Example computation of a set of quantized DCT coefficients.

DCT coefficients

120	60	40	30	4	3	0	0
70	48	32	3	4	1	0	0
50	36	4	4	2	0	0	0
40	4	5	1	1	0	0	0
5	4	0	0	0	0	0	0
3	2	0	0	0	0	0	0
1	1	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Quantized coefficients

12	6	3	2	0	0	0	0
7	3	2	0	0	0	0	0
3	2	0	0	0	0	0	0
2	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Quantizer

10	10	15	20	25	30	35	40
10	15	20	25	30	35	40	50
15	.20	25	30	35	40	50	60
20	25	30	35	40	50	60	70
25	30	35	40	50	60	70	80
30	35	40	50	60	70	80	90
35	40	50	60	70	80	90	100
40	50	60	70	80	90	100	110

Quantization table

BITS, Pilani – Dubai, Academic City, Dubai.
IV Year   SECOND SEMESTER   2007-2008
Degree: B.E. (Hons.) Branch: C.S. / E.I.E.
TEST I Question Paper
Course No : EA UC473   Course Title: Multimedia Computing
Date: 09, March, 2008 Sunday   Time: 50 min.   Total marks: 25
Data provided are complete. **Closed Book.**
This question paper has one page.

Answer all Questions.

1. The following character string is to be transmitted using HUFFMAN CODING:

UNIXMULTIUSERTIMESHARINGMULTITASKINGOPERATINGSYSTEM

Construct the HUFFMAN Coding Tree for the letters present in the above string and *determine* the number of bits required to code each letter.   [6 M]

2. Explain the basic principles involved in the following types of VIDEO SIGNALS:
        a) COMPONENT VIDEO b) Composite Video   [3 marks]

3. What is PROCEDURAL CONTROL in Animation ? [2 marks]

4. Distinguish between *Grouping* and *Extracting* in Image Recognition ? [2 M]

5. A photograph of (6 X 8 inches) is scanning in 300 dpi   resolution
        and **24 bit colour** (per pixel). The image is then saved in a JPEG file with
        1:20 compression ratio. It is then used on a web page. If a viewer connecting to
        internet uses a modem of transfer rate 2048 Kilobits / sec., how long will it take
        to download the compressed image to his/her computer? [3 M]

6. Mention the names of the components of a MIDI (musical instruments digital
interface) SYNTHESIZER device.   [2 MARKS]

7. Distinguish between CONTINUOUS STREAM and DISCRETE STREAM for a
multimedia system.   Give an example for each category.   [2 marks]

8. Draw the diagram w.r.t. GRANULARITY of a motion picture sequence (assume
uncompressed video sequence consisting of individual video clips). [2 marks]

9. Briefly explain the following terms w.r.t. AMPLITUDE ENVELOPE in MIDI

DELAY, ATTACK, HOLD, DECAY, SUSTAIN, RELEASE   [3 marks]