BITS, Pilani – Dubai Campus, Knowledge Village, Dubai

IV Year Second Semester 2006-2007

Degree: B.E. (Hons.) Branch: C.S./E.I.E.

Comprehensive Examination Question Paper

Course No : EA UC473 Course Title: Multimedia Computing

Date: 28/05/07 Time: 10 am – 1 noon Total marks: 60

Weightage: 40% Data provided are complete. ***Closed Book***.

This question Paper has 2 pages.

Part A Answer **all** Questions. 10*2=20 marks

1. Draw the diagram showing the Granularity of a MOTION PICTURE SEQUENCE (uncompressed video sequence).

2. Distinguish between FM Synthesis and WAVE-TABLE Synthesis in MIDI sounds.

3. You are given the following data w.r.t. digital video:
   Frame Rate = 25 frames per second
   No of **Scan Lines** in each frame = 625
   Horizontal Resolution = 425 **pixels** per *scan line*.
   Calculate the following: a) **TIME** (in Microseconds) required for **sampling** each **pixel** b) **Sampling Rate** (in Megahertz)

4. The following is the quantized sequence of Samples for an audio signal.

22, 24, 24, 28, 28, 28, 25, 26, 26, 26, 21, 19, 20, 20, 22, 24, 24, 24, 23, 24, 20, 16, 10, 10, 8, 11, 6, 9, 9, 12, 15, 19

Encode the quantized sequence using DPCM.

5. What is Diatomic Encoding? Give an example.

6. What is PREFIX PROPERTY in Huffman Coding ? Write the formula to find the expected number of bits per letter in Huffman Coding.

7. . What is use of LEAD-IN AREA and PROGRAM AREA in CD-DA (compact disk digital audio) ?

8. What is VIEW-SPECIFIC and SIMULTANEOUS DATA ACCESS in a multimedia database management system ?

9. In a multimedia user interface, what attributes contribute for AESTHETICS ?

10. Draw the diagram showing the individual elements in the MHEG (multimedia and hypermedia information coding expert group) class hierarchy in the form of a TREE.

Part B. Answer all questions.

11. 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) [5 marks]

12. . Draw the **QUICKTIME Architecture** Diagram and explain its various components and their functions. [6 marks]

13. Explain with a diagram TELEPHONY over the INTERNET w.r.t. interpersonal communications. [5 marks]

14. a) A photograph of (**6** X **8** inches) is scanning in 300 dpi resolution and 8 bit color. 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 256 Kilobits / sec., how long will it take to download the compressed image to his/her computer? [3 marks]
b) What is Symbolic Image Data Transmission? [2 marks]

15. The following problem relates to the **dimensions of a compressed image** using JPEG format:
You are given the following data: X_max = 1024 pixels ; i.e. the maximum of all X_i.
Y_max= 768 pixels; i.e. the maximum of all Y_i.
H_max=4 i.e. Maximum Horizontal sampling ratio.
V_max=4 i.e. Maximum Verical 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		
4	2		
1	4		
2	2		
4	4		

Here, (H_i, V_i) refer to relative horizontal and vertical sampling ratio for each component . [4 marks]

16. Briefly explain the basic functions of **B-FRAME** and **D-FRAME** in MPEG-1 VIDEO. (3 + 2 Marks)

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

18. Draw the following **diagrams only** w.r.t. GIF (Graphics Interchange Format):
a) Basic Operational Mode b) GIF Interlaced Mode (2+3 marks)

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IV Year Second Semester 2006 -2007

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TEST II Question Paper

Course No : EA UC473 Course Title: Multimedia Computing

Date: 13, May, 2007 Sunday Time: 8.00 am.- 8.50 am Total marks: 20

Data provided are complete. **OPEN *Book***

Text, References, Lecture Notes allowed.

1.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 5 7 9	8 6 5 7
6 6 9 3	5 6 8 3
9 7 8 3	10 7 10 4
10 12 6 7	9 10 7 6

[3M]

2. Given a scanned line of PELS (black or white), assuming a one-dimensional coding scheme, **find** the **CODE-WORD** for each of the following situations, (You can refer the table w.r.t. Group 3 and Group 4 facsimile conversion codes) in a digitized document.

Number of PELS (run-length)	TYPE	CODE-WORD
427	BLACK	
2650	WHITE	
2450	BLACK	
127	WHITE	
85	BLACK	
1753	WHITE	

[3 marks]

3. Consider an initial dictionary containing the following four characters:

CODE	STRING
1	A
2	B
3	C
4	D

Using LZW COMPRESSION principle ENCODE **each** of the following input STRINGS separately: (Tabulate your steps)

a) ABABCBABAB b) ABACABA [6 marks]

P.T.O.

4. Distinguish between *Basic Operational Mode* and *Dynamic Mode* in Graphic Interchange Format. [2 marks]

5. Distinguish between SNR Scalability and TEMPORAL Scalability in MPEG-2. [2 marks]

6. Mention an example application for each of the following MPEG-4 AUDIO-VISUAL Scenes:

a) 2D audio-visual scene involving the contents namely, *audio, video, still images* and *Animated text*.

b) 3D audio-visual scene involving the contents namely, *audio, video* and Still Images. [2 marks]

7. a) Discuss the need for Eight-to-Fourteen Modulation in CD-DA. [1 mark]

b) What is constant linear velocity [CLV] playback of a CD ? [1 mark]

Figure 3.11 ITU–T Group 3 and 4 facsimile conversion codes: (a) termination-codes, (b) make-up codes.

(a)

White run-length	Code-word	Black run-length	Code-word
0	00110101	0	0000110111
1	000111	1	010
2	0111	2	11
3	1000	3	10
4	1011	4	011
5	1100	5	0011
6	1110	6	0010
7	1111	7	00011
8	10011	8	000101
9	10100	9	000100
10	00111	10	0000100
11	01000	11	0000101
12	001000	12	0000111
13	000011	13	00000100
14	110100	14	00000111
15	110101	15	000011000
16	101010	16	0000010111
17	101011	17	0000011000
18	0100111	18	0000001000
19	0001100	19	00001100111
20	0001000	20	00001101000
21	0010111	21	00001101100
22	0000011	22	00000110111
23	0000100	23	00000101000
24	0101000	24	00000010111
25	0101011	25	00000011000
26	0010011	26	000011001010
27	0100100	27	000011001011
28	0011000	28	000011001100
29	00000010	29	000011001101
30	00000011	30	000001101000
31	00011010	31	000001101001
32	00011011	32	000001101010
33	0010010	33	000001101011
34	00010011	34	000011010010
35	00010100	35	000011010011
36	00010101	36	000011010100
37	00010110	37	000011010101
38	00010111	38	000011010110
39	00101000	39	000011010111
40	00101001	40	000001101100
41	00101011	41	000001101101
42	00101011	42	000011011010
43	00101100	43	000011011011
44	00101101	44	000001010100
45	00000100	45	000001010101
46	00000101	46	000001010110
47	00001010	47	000001010111
48	00001011	48	000001100100
49	01010010	49	000001100101
50	01010011	50	000001010010
51	01010100	51	000001010011
52	01010101	52	000000100100
53	00100100	53	000000110111
54	00100101	54	000000111000
55	01011000	55	000000100111

(a) cont.

White run-length	Code-word	Black run-length	Code-word
56	01011001	56	0000001101000
57	01011010	57	0000001011000
58	01011011	58	0000001011001
59	01001010	59	0000001101011
60	01001011	60	0000001101100
61	00110010	61	0000001011010
62	00110011	62	0000001100110
63	00110100	63	0000001100111

(b)

White run-length	Code-word	Black run-length	Code-word
64	11011	64	0000001111
128	10010	128	0000011001000
192	010111	192	0000011001001
256	0110111	256	0000001011011
320	00110110	320	0000001110011
384	00110111	384	0000001110100
448	01100100	448	0000001110101
512	01100101	512	0000001101100
576	01101000	576	0000001101101
640	01100111	640	0000001001010
704	011001100	704	0000001001011
768	011001101	768	0000001001100
832	011010010	832	0000001001101
896	011010011	896	0000001110010
960	011010100	960	0000001110011
1024	011010101	1024	0000001110100
1088	011010110	1088	0000001110101
1152	011010111	1152	0000001110110
1216	011011000	1216	0000001110111
1280	011011001	1280	0000001010010
1344	011011010	1344	0000001010011
1408	011011011	1408	0000001010100
1472	010011000	1472	0000001010101
1536	010011001	1536	0000001011010
1600	010011010	1600	0000001011011
1664	011000	1664	0000001100100
1728	010011011	1728	0000001100101
1792	00000001000	1792	00000001000
1856	00000001100	1856	00000001100
1920	00000001101	1920	00000001101
1984	000000010010	1984	000000010010
2048	000000010011	2048	000000010011
2112	000000010100	2112	000000010100
2176	000000010101	2176	000000010101
2240	000000010110	2240	000000010110
2304	000000010111	2304	000000010111
2368	000000011100	2368	000000011100
2432	000000011101	2432	000000011101
2496	000000011110	2496	000000011110
2560	000000011111	2560	000000011111
EOL	000000000001	EOL	000000000001

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IV Year SECOND SEMESTER 2006-2007

Degree: B.E. (Hons.) Branch: C.S. / E.I.E.

TEST I Question Paper

Course No : EA UC473 Course Title: Multimedia Computing

Date: 08, April., 2007 Sunday Time: 8.30 a.m.- 9.20 a.m. Total marks: 20

Data provided are complete. **Closed *Book***.

This question paper has one page.

Answer all Questions.

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

p(M)=0.42 p(V) = 0.35 p(S) = 0.14 p(K) = 0.09

Using ARITHMETIC CODING, DECODE **0.5620** [into a **4 letter** string]

[4 marks]

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

THEUNIXISAMULTIUSERMULTITASKINGMULTIPROGRAMMINGOS

Construct the HUFFMAN Coding Tree step by step for the letters present in the above string and *determine* the number of bits required to code each letter. [5M]

3. Explain each of the following with an example, in Multimedia Database Systems:
   a) Descriptive Search Methods
   b) Long Transaction
   c) Heterogeneous Multimedia Query [3 marks]

4. Explain the MCUs (minimum coded units) in JPEG standard. [3 marks]

5. What are AUDITORY DISPLAYS and TACTILE DISPLAYS in a multimedia user interface? [2 marks]

6. What information is stored in JPEG FRAME HEADER & SCAN HEADER? [2 marks]

7. What is DELTA MODULATION ? [1 mark]

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IV Year Second Semester 2006-2007
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QUIZ I (Set A)
Course No : EAUC473 Course Title: MULTIMEDIA COMPUTING
Date: 14, Mar., 2007 Wednesday Time: 30 minutes Total marks: 10
Weightage: 10% Venue : 204 ***Closed Book***.

IDNO: Name:

use backside of this sheet for rough work

Write answers in the space provided in question paper. Answer all questions.
Note:_____ means one or more words to be filled within a line.

1. Define Quantization. Mention an example scenario / application. [1 M]

2. What is *Change Notification* and *Update Control* in computer supported co-operative work? [1 M]

3. MIDI *Channel Messages* are classified into _____ &

_____. [1 M]

4. A bitmap image has 1024 x 768 pixels. Each pixel is 16 bit deep. What is the size of the bitmap in megabytes ? [1 M]

5. _____ includes all storage and transmission media. [0.5 M]

6. Define *Isochronous Transmission Mode*. [0.5 M]

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use backside of this sheet for roughwork

IDNO: Name:

7. Define *Weakly Regular Data Stream.* [0.5 M]

8. The steps in Image Recognition are *Conditioning, Labeling,* _____,

_____ and *matching*. [1 M]

9. What is INBETWEEN PROCESS in Animation ? [1 M]

10. Distinguish between COMPONENT VIDEO and COMPOSITE VIDEO. [1 M]

11. What is GAMUT of a COLOUR SYSTEM ? [0.5 M]

12. What is the function of STB (set-top box) in Interactive Television ? [1 M]