

BITS Pilani, Dubai Campus, Academic City, Dubai.

Comprehensive Examination Question Paper

II Semester 2013-2014

Degree: B.E.(Hons.)

Course No : CS F401 / EA C473 Course Title: Multimedia Computing

Date: 01/06/2014 Sunday Time: 3 hours AN Total marks: 40

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

This question paper has 2 pages.

Answer all Questions.

1. What are the main features and applications of each of the following Multimedia Service Classes?- a) **Silver** b) **Best Effort** [2 M]
2. Define *Resource*, *Metadata* and *Structure* w.r.t. MPEG-21 standard. [2 M]
3. What is the basic principle behind Eight-to-Fourteen Modulation in CD-DA? [2 M]
4. Write the equation corresponding to 2D Forward Discrete Cosine Transformation in JPEG image processing. [2 M]
5. What are the components present in Video Capture Cards ? [2 M]
6. Write a brief technical note on **Tele-action** services in multimedia communication. [3 M]
7. What are the major influencing factors for LIP SYNCHRONIZATION? [3 M]
8. Write down the names of the applications (at least two in each category) corresponding to each of the following functional partitions w.r.t. MPEG-4 standard:
 - a) Content-based interactivity
 - b) Universal Access
 - c) Improved Coding Efficiency[3 M]
9. Draw the block schematic (diagram) for Data Flow between a Multimedia Server and Client. [3 M]
10. a) A photograph of (6 X 8 inches) is scanning in 300 dpi (dots per inch) resolution and 8 bits/pixel with color information. 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 52 Kilobits / sec., how long will it take to download the compressed image to his/her computer? [2 M]
b) What is "LABELING" in IMAGE RECOGNITION? Give an example of a labeling operation. [1 M]

P.T.O.

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

150	70	40	30	4	3	0	0
70	48	30	3	4	1	0	0
50	48	4	4	2	0	0	0
40	48	5	5	1	0	0	0
5	4	30	0	0	0	0	0
3	2	3	40	0	0	0	0
1	1	1	0	0	0	0	0
2	2	2	0	0	0	0	0

Construct the **HUFFMAN Coding Tree** for the above intensity values present in the above image and *determine* the number of bits required to code each intensity value. [5 M]

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

$$p(G)=0.40 \quad p(I)=0.30 \quad p(K)=0.20 \quad p(N)=0.10$$

Using **ARITHMETIC CODING**,

a) **Encode** the string **KING**

b) **Decode** **0.6201** [into a 4 letter string] [5 M]

13. **Construct Table II** for dictionary-based **LZW Compression Algorithm**, as shown below (algorithm need not be written; **only the table entries are to be filled for successive steps, as necessary**).

Let the **STRING TABLE** (dictionary) initially contains only 3 characters with codes as shown in Table 1.

Table 1

Code	String
1	A
2	N
3	D

If the Input String is

AAAAAANNNNNNDDDDANDDDNAANDDDNAANDANDANDDDNA

write the output codes for the above input string.

TABLE II

s	c	output	code	string
			1	A
			2	N
			3	D
....
.....

[5 M]

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SECOND SEMESTER 2013-2014

Degree: B.E. (Hons.)

TEST II Question Paper

Course No : CS F401/ EA C473 Course Title: Multimedia Computing

Date: 13, April., 2014 Sunday Time: 50 min. Total marks: 20

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

Text Books / REFERENCE BOOK and class notes permitted.

This question paper has two pages.

Answer all Questions.

1. In JPEG, Explain why DIFFERENTIAL ENCODING is used for compression of DC coefficients in successive blocks. [2 M]

2. 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		
2	4		
1	4		
1	2		

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

3. 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
6 9 5 8	6 10 5 9
5 4 5 6	4 5 7 6
9 8 9 6	10 7 9 2

[3M]

4. How is PROCEDURAL CONTROL in Animation carried out?

[2 M]

P.T.O.

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4. **Construct Table II** for dictionary-based LZW Compression Algorithm as shown below (algorithm need not be written; **only the table entries are to be filled for successive steps as necessary**).

Let the STRING TABLE (dictionary) initially contains only 2 characters with codes as shown in Table 1.

Table 1

Code	String
1	M
2	R

If the Input String is **MMMMRMMMMRMMMMRMRMRMRMM**
 write the *output codes* for the above input string.

TABLE II

s	c	output	code	string
			1	M
			2	R
...
...

(Draw this table with as many rows, as necessary)

[5 M]

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

$$p(C)=0.45 \quad p(I) = 0.35 \quad p(L) = 0.15 \quad p(O) = 0.05$$

Using ARITHMETIC CODING,

- a) Encode the string COIL
- b) Decode 0.3512 [into a 4 letter string]

[6 M]

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SECOND SEMESTER 2013-2014

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TEST I Question Paper

Course No : CS F401 / EA C473 Course Title: Multimedia Computing

Date: 23/02/2014 Sunday Time: 50 min. Total marks: 25

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

This question paper has one page.

Answer all Questions.

1. Distinguish between Continuous Stream and Discrete Stream in multimedia systems. Mention an example application in each category. [2 M]

2. Explain LDU hierarchy (logical data units) with an illustration. [3 M]

3. What are Dither Patterns w.r.t. Images? [2 M]

4. A multimedia presentation has 40 minutes of CD-Quality Digital Audio in .wav files. Given the following parameters for CD-DA,

Sample Frequency : 44.1 KHz

Quantization : 16 bits / sample

No of Channels = 2 (assume Stereo)

What is the storage capacity required for these files in MB ? [2 M]

5. A photograph of (9 X 10 inches) is scanning in 600 dpi resolution and 16 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 1024 Kilobits / sec., how long will it take to download the compressed image to his/her computer? [3 M]

6. What are the components of a MIDI Synthesizer Device? [3 M]

7. How is the Image Size determined for the following scenarios:-?

a) Raw Image Data Transmission. b) Compressed Image Data Transmission.

c) Symbolic Image Data Transmission. [3 M]

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

IMPROVEMENTSOFEXISTINGMULTIMEDIA

Construct the HUFFMAN Coding Tree for the letters present in the above string and *determine* the number of bits required to code each letter. [7 M]