EBU5305 A

Complete the information below about yourself very carefully.

QM student number

BUPT student number

Class number

Joint Programme Examinations 2015/16

EBU5305 Interactive Media Design and Production

Paper A

Answer ALL questions

NOT allowed: electronic calculators and electronic dictionaries.

INSTRUCTIONS

1. **You must not take answer books, used or unused, from the examination room.**
2. Write only in black or blue pen **and in English**.
3. Do all rough work in the answer book – **do not tear out any pages**.
4. If you use Supplementary Answer Books, tie them to the end of this book.
5. Write clearly and legibly.
6. **Read the instructions on the inside cover.**

Examiners

Dr Marie-Luce Bourguet, Dr Ling Ma

Instructions

<u>Before the start of the examination</u>

1) Place your BUPT and QM student cards on the corner of your desk so that your picture is visible.

2) Put all bags, coats and other belongings at the back/front of the room. All small items in your pockets, including wallets, mobile phones and other electronic devices must be **placed in your bag in advance**. **Possession of mobile phones, electronic devices and unauthorised materials is an offence.**

3) Please ensure your mobile phone is switched off and that no alarm will sound during the exam. **A mobile phone causing a disruption is also an assessment offence.**

4) Do not turn over your question paper or begin writing until told to do.

<u>During the examination</u>

1) You must not communicate with or copy from another student.

2) If you require any assistance or wish to leave the examination room for any reason, please raise your hand to attract the attention of the invigilator.

3) If you finish the examination early you may leave, but not in the first 30 minutes or the last 10 minutes.

4) For 2 hour examinations you may **not** leave temporarily.

5) For examinations longer than 2 hours you **may** leave temporarily but not in the first 2 hours or the last 30 minutes.

<u>At the end of the examination</u>

1) You must stop writing immediately – **if you continue writing after being told to stop, that is an assessment offence.**

2) Remain in your seat until you are told you may leave.

Question 1

a) Digitisation.

[5 marks]

    i)   Let n be the number of bits used to quantise a digital sample. What is the maximum number of values that can be represented?

(1 mark)

    ii)   Let f be the frequency of a sine wave. What is the minimum sampling rate that can be used in the digitisation process so that the resulting digitised wave is not aliased?

(1 mark)

    iii)   Calculate the size <u>in bytes</u> of a video file, which has the following characteristics: frame size is 300 pixels x 200 pixels, true colour encoding, frame rate is 25 frames/s, no audio track, duration is 1 minute.

(3 marks)

	Do not write in this column
	5 marks

b) Colour.

[5 marks]

    i)   Describe the properties of a fully saturated colour.

(1 mark)

    ii)   In the RGB colour model, how is the grayscale represented?

(1 mark)

    iii)   What (R, G, B) values would you use to encode an unsaturated bright green colour?

(1 mark)

    iv)   What (H, S, V) values would you use to encode a fully saturated dark red colour?

(1 mark)

    v)   Magenta ink is spread onto a white sheet of paper. What colour will you see if the paper is illuminated with a green light?

(1 mark)

	Do not write in this column
	5 marks

c) Image compression.

[5 marks]

i) What image property is used in Run Length Encoding (RLE) to achieve compression?

(1 mark)

ii) How would you encode the following sequence of bytes using RLE, and how much compression do you achieve?

Sequence of bytes: ABCCCAAAABBBBCCCCCDD

(3 marks)

iii) What is the most efficient image compression technique for a vector-based image?

(1 mark)

	Do not write in this column
	5 marks

d) Consider the 4x4 matrix of DCT coefficients shown in Table 1 below.

[5 marks]

1000	35	100	40
100	100	25	20
75	80	40	20
20	10	5	2

Table 1

i) Apply quantisation to the DCT coefficients of Table 1, using the quantisation matrix shown in Table 2, and calculate a new matrix of rounded quantised values.

(2 marks)

10	20	50	99
20	50	99	99
50	80	99	99
99	99	99	99

Table 2

ii) How many values have been rounded to zero? Where are they located in the new matrix and why?

(2 marks)

iii) To obtain a better quality image after decompression, what would you change to the quantisation matrix of Table 2?

(1 mark)

	Do not write in this column

	5 marks

e) MPEG.

[5 marks]

    i)   What type of MPEG frame is not temporally compressed?

(1 mark)

    ii)   What is encoded after motion estimation has been successfully performed on a macro block?

(2 marks)

    iii)   Why are B-frames typically more compressed than P-frames?

(2 marks)

	Do not write in this column
	5 marks

Question 1 in total: $\dfrac{}{5} + \dfrac{}{5} + \dfrac{}{5} + \dfrac{}{5} + \dfrac{}{5} = \dfrac{}{25}$

Question 2

a) Use of media.

[5 marks]

    i)   Sound can be disruptive. Explain how you can limit its disruptiveness.

(2 marks)

    ii)   How are colours best used to show contrast for details?

(2 marks)

    iii) Give one good use of video in multimedia.

(1 mark)

	Do not write in this column
	5 marks

b) Design and human cognition.

[5 marks]

    i)   Explain the Gestaltists' law of good continuation and provide an illustration.

(3 marks)

    ii)   Explain the cognitive process of "recall".

(2 marks)

	Do not write in this column
	5 marks

c) Structure and navigation.

[5 marks]

i)   Explain what a deep structure is and provide an illustration.

(3 marks)

ii)   In reference to your illustration of question i above, is the structure you drew well connected or sparsely connected? Justify your answer.

(2 marks)

	Do not write in this column
	5 marks

d) Consider the image shown in Figure 1 (it is a screen shot of the top of the QMplus login page) and answer the two questions below.

[10 marks]

Figure 1

i) Comment the design of the web page shown in Figure 1 in terms of its layout, choice of media and usability. What is good? What is wrong?

(5 marks)

ii) Suggest some possible improvements.

(5 marks)

	Do not write in this column

| | 10 marks |

Question 2 in total: $\dfrac{}{5} + \dfrac{}{5} + \dfrac{}{5} + \dfrac{}{10} = \dfrac{}{25}$

Question 3

a) In the design process studied in class, what are the three steps of the information phase? Explain them briefly.

[5 marks]

	Do not write in this column
	5 marks

b) Storyboarding.

[10 marks]

i)   What is a storyboard?

(3 marks)

ii)   During which phase of the interactive media design process is storyboarding useful?

(2 marks)

iii)   In your opinion, what are the main differences between a storyboard for interactive media and a storyboard for animation movies, such as the one shown in Figure 2 below?

(5 marks)
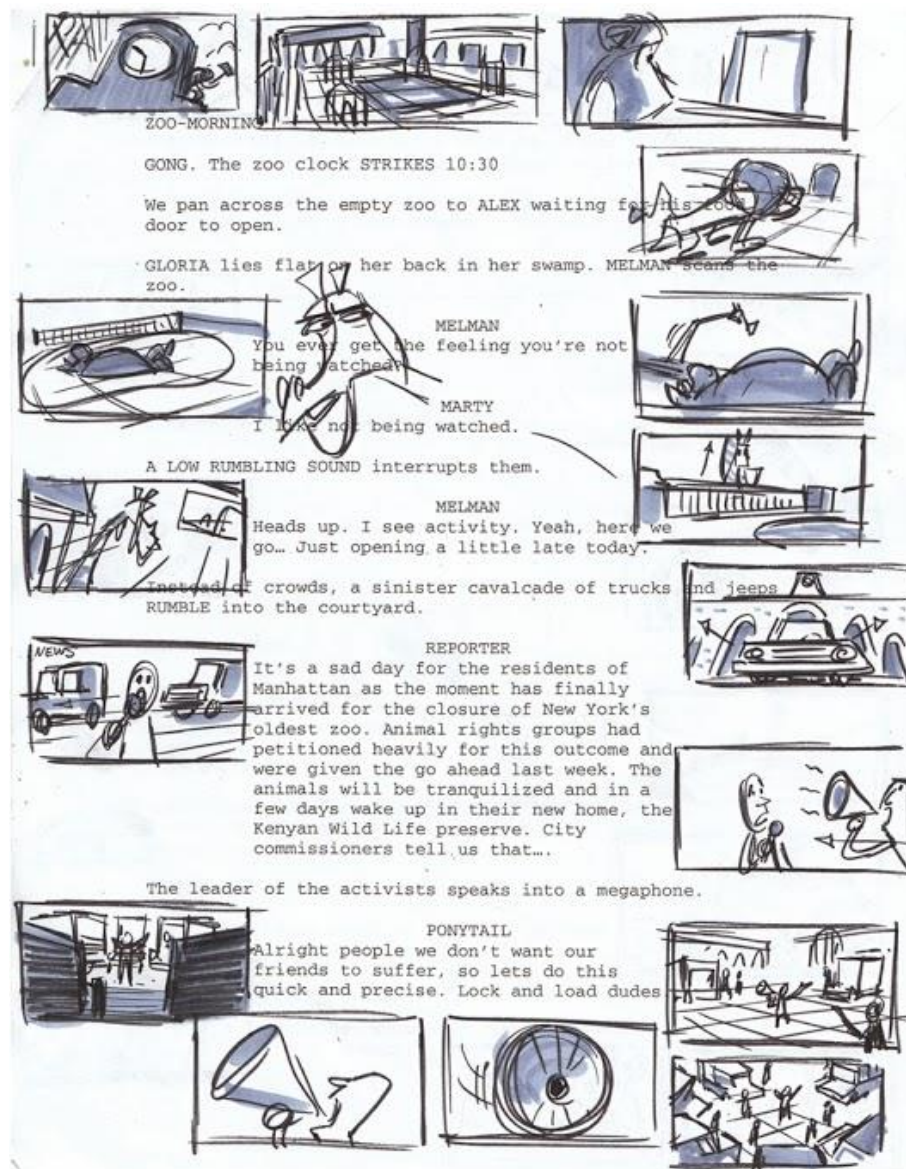
Figure 2

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10 marks

c) You are part of a team who is designing an interactive media application to teach MPEG compression to students.

[10 marks]

i)   During your first team meeting, you do a brainstorming session. What is the purpose of such a session and how should it be conducted?

(3 marks)

ii)   Your next team meeting is about building a mind map. Explain the purpose of this second meeting and how it relates to the outcome of the first one.

(3 marks)

iii) Sketch your own mind map for an interactive media application that teaches MPEG to students.

(4 marks)

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10 marks

Question 3 in total: $\dfrac{}{5} + \dfrac{}{10} + \dfrac{}{10} = \dfrac{}{25}$

Question 4

a) Answer the multiple choice questions below by entering your choice (A, B, C or D) in the dedicated space (the small square that appears at the bottom right of each question). For each question, make <u>only one</u> choice.

[10 marks]

	Do not write in this column
i) Consider Heuristic H1 (visibility of system status). Which good design below complies best with H1? A. A back button is provided on every page. B. A progress bar is provided to show downloading time. C. Short cuts are provided for expert users. D. Users can undo their actions at any time.	**(2 marks)**
ii) Consider Heuristic H5 (error prevention). Which good design below complies best with H5? A. Mandatory fields are clearly indicated in the form. B. A list of all possible options is provided in a list. C. Complementary colours are not used in close proximity. D. A progress bar is provided to show downloading time.	**(2 marks)**
iii) Consider Heuristic H6 (recognition rather than recall). Which good design below complies best with H6? A. Users are notified when the caps lock key is on. B. A back button is provided on every page. C. A list of all possible options is provided in a list. D. Short cuts are provided for expert users.	**(2 marks)**
iv) Consider Heuristic H8 (aesthetic and minimalist design). Which good design below complies best with H8? A. Users can undo their actions at any time. B. A progress bar is provided to show downloading time. C. Complementary colours are not used in close proximity. D. A back button is provided on every page.	**(2 marks)**
v) Consider Heuristic H9 (help users recognize and recover from errors). Which good design below complies best with H9? A. Users are notified when the caps lock key is on. B. A progress bar is provided to show downloading time. C. Short cuts are provided for expert users. D. Complementary colours are not used in close proximity.	**(2 marks)**

b) Answer the multiple choice questions below by entering your choice (A, B, C or D) in the dedicated space (the small square that appears at the bottom right of each question). For each question, make <u>only one</u> choice.

[10 marks]

	Do not write in this column
i) Which of the following usability problems violates most Heuristic H2 (match between system and real world)? A. Users must confirm their name on every page. B. The delete icon shows an opened envelop. C. Users must type a file name to open it. D. There is no back button on the last page.	**(2 marks)**
ii) Which of the following usability problems violates most Heuristic H3 (user control and freedom)? A. The exit button is coloured green. B. The home button is sometimes on the right, sometimes on the left side. C. There is no back button on the last page. D. The front page has no title.	**(2 marks)**
iii) Which of the following usability problems violates most Heuristic H4 (consistency & standards)? A. There is a horizontal scroll bar. B. The logo of the company is animated on every page. C. The home button is sometimes on the right, sometimes on the left side. D. There is no back button on the last page.	**(2 marks)**
iv) Which of the following usability problems violates most Heuristic H7 (flexibility and efficiency of use)? A. The front page has no title. B. Users must confirm their name on every page. C. The exit button is coloured green. D. The delete icon shows an opened envelop.	**(2 marks)**
v) Which of the following usability problems violates most Heuristic H8 (aesthetic and minimalist design)? A. There is a horizontal scroll bar. B. Users cannot undo their actions. C. The logo of the company is animated on every page. D. There is no back button on the last page.	**(2 marks)**

c) Consider the dialogue window shown in Figure 3.
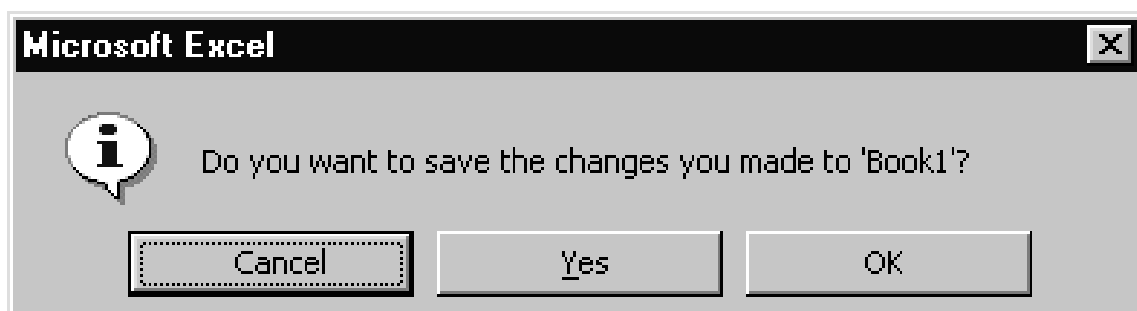
[5 marks]

Figure 3

    i)   Describe the usability problem and give the heuristic it violates.

(3 marks)

    ii)   What severity factor would you assign to the usability problem you described in question i above?

(1 mark)

    iii)   Suggest a solution.

(1 mark)

	Do not write in this column
	5 marks

Question 4 in total: $\dfrac{}{10} + \dfrac{}{10} + \dfrac{}{5} = \dfrac{}{25}$

Use this section for rough work

	Do not write in this column

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Use this section for rough work

	Do not write in this