DUBLIN INSTITUTE OF TECHNOLOGY

DT228 BSc. (Honours) Degree in Computer Science

Year 2

SUMMER EXAMINATIONS 2016/2017

HUMAN COMPUTER INTERACTION [CMPU2008]

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TUESDAY 9TH MAY 6.30 P.M. – 8.30 P.M.

TWO HOURS

ANSWER **QUESTION (1)** AND **ANY TWO** OTHER QUESTIONS

QUESTION (1), CARRIES **40** MARKS.
QUESTIONS (2), (3), AND (4) CARRY **30** MARKS EACH.

Q1. (a) Describe the five Gestalt laws of perceptual organisation and explain why they are important in screen design. **(10 marks)**

(b) Explain how the following design principles can be used to enhance the design of an interface.

- Affordance
- Mapping **(4 marks)**

(c) Miller has proposed that 7 ± 2 chunks of information can be held in human short-term memory at any one time. How does such a characteristic of short-term memory influence interface design? **(5 marks)**

(d) Briefly describe Norman's concepts of the *gulf of execution* and the *gulf of evaluation* and indicate how an interface designer can bridge these gulfs for effective human-computer interaction. **(7 marks)**

(e) Explain why Graphical User Interfaces (GUIs) have enhanced the ability of novice computer users to interact with computer systems under the following headings.

- Mental Models
- Metaphors **(8 marks)**

(f) Briefly explain why *prototyping* may be a useful design tool in user interface design. **(6 marks)**

Q2. (a) List and explain *four* techniques that may be used to focus user *attention* on information displayed on a computer screen. **(8 marks)**

(b) Explain how users learn through *analogy* and indicate how this learning can be facilitated in computer systems design. **(10 marks)**

(c) The Key Stroke Level Model (KLM) is to be used to develop numerical predictions of user performance of a new system. Using the operator steps and times provided in Table 1, estimate the time that will be taken by an experienced computer user to enter the following information into a text box on the screen:

"Account has been closed"

Explain any assumptions made in your calculations. **(12 marks)**

Operator	Description	Time (sec)
K	Pressing a single key or button Average skilled typist (55 wpm) Average non-skilled typist Pressing shift or control key Typist unfamiliar with keyboard	0.35 0.22 0.28 0.08 1.20
P P1 D	Pointing with a mouse or other device on a display to select an object Clicking the mouse of similar device Draw a line with a mouse	1.10 0.20 Variable
H	Bring "home" hands on the keyboard or other device	0.40
M	Mentally prepare/respond	1.35
R(t)	System response time is counted only if it causes the user to wait	T

Table 1

Q3. (a) Define the terms *user interface* and *usability*. **(4 marks)**

(b) *Ease of use* and *user-friendliness* are two terms often used to characterise usable computer systems. Describe the desirable qualities of a high ease of use and user-friendly computer system. Include *five* appropriate ease of use criteria and *five* appropriate user-friendliness criteria in your answer. **(8 marks)**

(c) The Principles of Universal Design define seven principles that can be used to guide the design process of usable interactive systems. Briefly explain the concept of Universal Design and describe how *any five* of the design principles can be used to guide the design of an Automated Ticket Machine that will allow members of the public to buy bus tickets at a bus station. Include *at least one* specific design suggestion for each of the five principles that you use. **(18 marks)**

Q4. (a) A new electronic voting system is to be commissioned that will accept and analyse votes for national elections. The system will be used at voting centres on election day.

(i) Recommend a suitable *lifecycle model* that should be used to develop the system. **(6 marks)**

(ii) Recommend an appropriate *interaction style* for the system. **(5 marks)**

(iii) Recommend appropriate *input and output device(s)* for the system, explaining the reasons for your choice. **(11 marks)**

Give a clear indication of the rationale for your recommendations in *(i)*, *(ii)*, and *(iii)*, and for the alternative option(s) that you have rejected.

(b) Describe how any *two* of Nielsen's usability principles may be applied to improve the usability of the voting system described in Part (a). Use specific examples to support your answer. **(8 marks)**