BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

USER EXPERIENCE

SAMPLE PAPER AND ANSWER POINTERS

Answer **any** FOUR questions out of SIX. All questions carry equal marks.
Time: TWO hours.

Answer any <u>Section A</u> questions you attempt in <u>Answer Book A</u>
Answer any <u>Section B</u> questions you attempt in <u>Answer Book B</u>

*The marks given in brackets are **indicative** of the weight given to each part of the question.*

Calculators are **NOT** allowed in this examination.

A1.

You are working for a company that is considering introducing a brand-new system, with a novel user experience. The critical aspect of the system is the user's speed of task completion. As part of the system evaluation, you have tested a user group of 10 participants with both the old and proposed new system. The results of the test (in minutes) are given below:

Old: 10, 23, 25, 17, 20, 15, 19, 40, 33, 45

New: 6, 8, 12, 35, 29, 17, 15, 31, 28, 14

a) Using the Mann-Whitney method of data analysis, establish whether there is a significant difference between the two speeds of task completion of the systems, based on the above data. You should use the table at the end of the question to test the U-value.

(15 marks)

b) In addition to speed of task completion, you are also asked to evaluate the users' overall experience of the new system. How might you do this, and what are the issues you need to consider, in the context of User Experience (UX)?

(10 marks)

$n1\backslash n2$	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2			0	1	1	1	2	2	3	3	4	4	4	5	5	6	6	7	7
3		0	1	2	3	4	5	5	6	7	8	9	10	10	11	12	13	14	15
4	0	1	2	4	5	6	7	9	10	11	12	13	15	16	17	18	20	21	22
5	1	2	4	5	7	8	10	12	13	15	17	18	20	22	23	25	27	28	30
6	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	34	36	38
7	1	4	6	8	11	13	16	18	21	23	26	28	31	33	36	38	41	43	46
8	2	5	7	10	13	16	19	22	24	27	30	33	36	39	42	45	48	51	54
9	2	5	9	12	15	18	22	25	28	31	35	38	41	45	48	52	55	58	62
10	3	6	10	13	17	21	24	28	32	36	39	43	47	51	54	58	62	66	70
11	3	7	11	15	19	23	27	31	36	40	44	48	52	57	61	65	69	73	78
12	4	8	12	17	21	26	30	35	39	44	49	53	58	63	67	72	77	81	86
13	4	9	13	18	23	28	33	38	43	48	53	58	63	68	74	79	84	89	94
14	4	10	15	20	25	31	36	41	47	52	58	63	69	74	80	85	91	97	102
15	5	10	16	22	27	33	39	45	51	57	63	68	74	80	86	92	98	104	110
16	5	11	17	23	29	36	42	48	54	61	67	74	80	86	93	99	106	112	119
17	6	12	18	25	31	38	45	52	58	65	72	79	85	92	99	106	113	120	127
18	6	13	20	27	34	41	48	55	62	69	77	84	91	98	106	113	120	128	135
19	7	14	21	28	36	43	51	58	66	73	81	89	97	104	112	120	128	135	143
20	7	15	22	30	38	46	54	62	70	78	86	94	102	110	119	127	135	143	151

A1 Answer pointers

a) Hn = There is no difference in task completion time between the systems (null hypothesis)

Ha = There is a difference in task completion time between the systems (alternative hypothesis)

Ranks:

Old: 10(3), 23(12), 25(13), 17(8.5), 20(11), 16(7), 19(10), 40(19), 33(17), 45(20)

New: 6(1), 8(2), 12(4), 35(18), 29(15), 17(8.5), 15(6), 31(16), 28(14), 14(5)

Sum of ranks: Old = 120.5; New = 89.5

$U = n1.n2 + (n1.n2+1)/2$ – largest sum of ranks = 155 -120.5 = 34.5

Compare U value with critical value in table for n1 and n2 = 10 (32)

34.5 > 32, so we cannot reject the null hypothesis. Therefore, there is **no difference in the task completion times between the systems**.

b) Candidates should demonstrate their awareness of a number of techniques for evaluation such as surveys, interviews, heuristic evaluation, walkthroughs, and the need perhaps for both qualitative and quantitative evaluation techniques. Strong candidates may write about ethical issues (consent), validity and reliability, and suggest larger sample sizes for any quantitative analysis. Also, such students might put together an evaluation plan comprising a number of the aforementioned techniques to be conducted in a logical order, perhaps citing specific tools (e.g. SUS, SUMI, QUIS).

A2.

    a)   Briefly describe the PACT UX framework.

(8 marks)

    b)   Use the PACT framework to consider the UX issues that may arise in the context of a smart home system. The system will be used by a typical family (parents + children aged 7 and 11), and will include heating, lighting, door access, and home hub features.

(17 marks)

A2 Answer pointers

[Syllabus coverage: 1. The essentials of user experience; 2. Techniques for specifying, analysing and designing interactive systems]

    a) *2 marks for each of the 4 elements of PACT. 1 point each for recall of the acronym: People, Activities, Contexts and Technologies. 1 more mark for a sensible description of each, perhaps with examples.*

    b) *Candidates might write about a range of issues, some of which are highlighted below, though it should be emphasised that this isn't an exhaustive discussion.*

        a. ***People****: They might use personas for this to describe some physical and cognitive differences within the family, and the issues that could arise e.g. familiarity and competence with technology, psychological differences, physical differences e.g. height, strength, dexterity that could affect interface selection.*

        b. ***Activities****: What activities and tasks will the family perform? Heating on/off, programming, same with lighting, doors locking/unlocking. They should discuss who might have access to which features, and how that might affect the interface design. Also, what about cross-platform issues? More than one person might want to perform an activity at the same time. How could this be controlled, for example? Candidates might consider one or two scenarios and describe them, or even sketch them out.*

        c. ***Contexts****: The physical environment of the home needs to be considered, of course, but what about remote access. What about security and safety issues of being able to perform activities such as unlocking doors remotely? What about support for users as well (social context)? What about accessibility – should some smart home technology be out of reach of children for example?*

        d. ***Technologies****: The home hub is mentioned, and presumably will be the main interaction device. But what about other devices e.g. mobile technologies, web access? Should certain features only be available on certain devices? What about issues of speech recognition (not 100% reliable)? What kind of visual interface should be used on a device with a screen – a layout of the house, or in list form, or both?*

Up to 4 marks for each issue, with one extra reserved for an exceptionally high-quality discussion. Strong candidates should be able to use the language of UX to support their discussion, and this will be rewarded appropriately.

A3.

a) You are a UX consultant involved in a project focusing on designing a book reader device for senior citizens (i.e. people over 65 years old) new to reading a book using an electronic device. How would you go about the understanding the user needs, abilities and or limitations?

(10 marks)

b) As a UX consultant you are also involved in a project focusing on designing an educational application for smart devices to be used by children aged 5-7 years old. How would you go about understanding the user needs, abilities and/or limitations?

(10 marks)

c) Discuss why the use of paper/low fidelity prototyping is important when designing a mobile application.

(5 marks)

A3. Answer pointers

[Syllabus coverage: 4. Understanding users (4.1, 4.2, 4.3), 1. The essentials of user experience (1.1, 1.3)]

a) *The answer should overall highlight the need to focus early on users and tasks, empirical measurement and iterative design.*

You need to find out about the characteristics of potential users, their behaviour, the tasks and goals as well as the context of use. It is important to involve users in the design process.

Studying and observing how senior citizens reading books (currently and without electronic devices) will provide useful information and it will also highlight certain challenges that would need to be addressed while designing the book reader. It will be also useful to study senior citizens who are already using book readers. This will help with understanding how they use such devices and finding the advantages and disadvantages of such group of users using book readers in different setting and observing their behaviours. Interviewing such group of users will provide valuable insights regarding their needs and what they might be finding challenging. Overall, you need to consider what are the abilities (cognitive, developmental, physical etc) and limitations of this particular age group.

(10 marks)

b) *As with (a) above, the answer should overall highlight the need to focus early on users and tasks, empirical measurement and iterative design. Participatory design (i.e. bringing children into the heart of the design process) would be very important.*

You need to find out about the characteristics of potential users, their behaviour, the tasks and goals as well as the context of use. It is important to involve users in the design process. Studying and observing how children of that particular age group a) learn and b) interact with technology and particular an iPad, will provide

useful information and it will also highlight certain challenges that would need to be addressed while designing the educational application. Most importantly, you need to consider what are the abilities (cognitive, developmental, physical etc) and limitations of this particular age group.

(10 marks)

c) *The use of paper/low fidelity prototyping is important when designing a mobile application as there are several benefits including:*

- *By testing early designs with users, we obtain feedback and then iterate.*

- *Users are feeling more comfortable in commenting and being critical with low fidelity/paper prototypes.*

- *Furthermore, users are not distracted by details of the interface (visual) elements and visual design. Therefore, it is easier to identify problems with layout, task flows, interaction design, navigation, information architecture etc.*

The question assesses whether a student is aware of the importance and benefits of using low-fidelity prototyping. There are further possible answers here related to low-fidelity prototyping benefits and if correct will be acceptable.

(5 marks)

Section B
Answer Section B questions in Answer Book B

B4.

a) You are working in a team that wants to develop an innovative device for people with diabetes to help them record and monitor their blood sugar levels. Although there are certain products already on the market, they are sometimes viewed as large and bulky. Many people with diabetes rely on manual recording and monitoring methods such as using a finger-tip prick blood test. You are responsible for the collection of data in order to further understand the user needs, requirements and context of use.

Discuss what kind of data gathering technique(s) would be most appropriate to use (please provide **TWO** techniques), and how might these different data gathering techniques be used.

Assume that you are at the beginning of the development of the device and that you have enough time and resources to use any of the available techniques.

(10 marks)

b) Your UX team is considering two alternative early prototypes: Prototype A and Prototype B for a dashboard/control panel interface that is going to be used by approximately 50 workers in a warehouse. Most members of your team think Prototype A is a better solution but there are also some team members who are very vocal in their preference for Prototype B. What would you recommend doing in order to decide between the two prototypes?

(5 marks)

c) *"Help users recognise, diagnose and recover from errors"* – what does this mean in designing an interface? Provide an example to support your answer.

(5 marks)

d) Explain the purpose of testing a prototype with users.

(5 marks)

B4. Answer pointers

[Syllabus coverage: 4 Understanding users, 5 Testing and evaluation]

a) *Marks will be allocated for two appropriate examples of data gathering techniques. In particular full marks will be given for providing and justifying) the following two techniques i.e. interviews (5 marks) and observations (5 marks) as these two techniques are most useful in this scenario in order to identify user needs and the context of use. If the only technique provided (without appropriate justification) is survey/questionnaire 3 marks maximum will be allocated. In particular a sample answer could be:*

Sample answer 1:

Interviews: *It is important to interview some of the potential users i.e. people with diabetes (ensuring that you have a representative sample). (This could be done via posting an announcement at the local diabetes clinic announcing this research opportunity). A further group to interview could be people with diabetes that currently use other products in the market. These people could be questioned and find out the problems of existing devices, so that new devices can improve on them. (5 marks)*

Observations: *Conducting observations (of the existing manual operation) would be useful in order to understand what is required and in order to find out about users' context, tasks and goals in the natural setting. (5 marks)*

Sample answer 2 (max 3 marks):

Survey/Questionnaire: *A questionnaire could be sent to a wider group of users. (3 marks)*

The question assesses whether a student is aware of UX research and evaluation techniques such as when to use surveys, observations or other techniques.

(10 marks)

b) *The student should recommend running a usability test of the two prototypes in order to decide between the two.*

(5 marks)

c) *Error messages should be expressed in plain language, indicate clearly the problem and constructively suggest a solution.*
There are several possible examples here and if correct will be acceptable.
For example:
Error messages that are not meaningful to users.
In online forms, if the user enters the wrong username and password and the error message, they receive is either the username or the password is incorrect. This means that the interface/system does not inform the user if the username is invalid or if the password is wrong.

(5 marks)

d) *There are several possible answers here and if correct will be acceptable. For example:*
- *The purpose of testing a prototype is to ensure that time and money go into creating the right product for the users.*
- *Making design changes is fast and easy.*
- *Prototyping can be a quick and effective way of bringing client's ideas to life.*

(5 marks)

B5.

a) A company called GB National Trains has asked you to conduct usability testing of their mobile application (app) in order to see whether their customers can successfully book their train ticket online using the app.

What types of data (i.e. what metrics) would need to be gathered regarding usability testing to see whether the app is successful, or in case there are any problems? Please provide **THREE** types of data (i.e. three metrics).

(9 marks)

b) *"Interfaces should be designed in such way that promote recognition rather than recall"*. Provide an example to explain this principle.

(6 marks)

c) In UX design it is important that information or meaning must not be conveyed by colour only. Explain why this is important and provide an example to illustrate this.

(10 marks)

B5. Answer pointers

[Syllabus coverage: 4.1 4.2 4.3]

a) *Students could mention three of these (3 * 3 marks = 9 marks):*
- *Time to complete a task.*
- *Time to complete a task after a specified time away from the system.*
- *Number and type of errors per task.*
- *Number of errors per unit of time.*
- *Number of navigations to online help.*
- *Number of users making a particular error.*
- *Number of users completing the task successfully.*

(9 marks)

b) *There are several possible examples here and if correct will be acceptable. For example (3 marks for a recall example and 3 marks for recognition example):*

- *An example of recall in an interface is login. When a user logs in to a site, the user has to remember both a username (or email) and a password.*
- *An example of recall: Command-line interfaces. If a user wishes to rename a file called myfile in a UNIX system, they would have to type the particular UNIX command i.e. mv myfile yourfile. The user would have to recall not only that mv is the command for move, but also the correct order of the arguments.*

- *An example of recognition: Most e-commerce websites (e.g. Amazon) show users lists or photos of recently visited items. These lists (or photos) help users remember to complete a purchase that they may have started some days ago. They promote recognition, because users do not need to remember information that they may have seen in the past or recall what that product might have been called.*

- *An example of recognition: Quora website (and Google search) suggests possible questions based on what the user is trying to type.*

(6 marks)

c) *Colours can be difficult to distinguish in bright sunlight and cannot be perceived by users who are colour blind, or visually impaired. Screen readers do not detect colour and some users will change the colour settings for their whole computer i.e. operating system. For example, setting their computer to grayscale or applying a tint to help with reading. Lower specification mobile devices also offer poor colour support.*

(5 marks)

d) *In addition, different cultures attach their own meaning (value) to certain colours and therefore colour associations vary from culture to culture. Example here should also be provided.*

(5 marks)

B6.

    a) Keyboard accessibility requires that your website works with a keyboard. Explain how the keyboard accessibility of a single webpage is tested.

(5 marks)

    b) What is meant by 'No Keyboard Trap'?

(5 marks)

    c) Sighted keyboard users need to be able to see where the keyboard focus is at all times. Explain what happens when the 'Visual Focus Indicator' is turned off in the CSS.

(5 marks)

    d) It is best practice to make the tab/reading order of webpages match the visual order. Explain what is meant by having a linear tab/reading order.

(5 marks)

    e) Generally opening new windows is a bad idea and one that most people would advise avoiding. Explain how opening new windows based on focus change can cause accessibility issues.

(5 marks)

B6. Answer pointers

[Syllabus coverage: 4 Understanding Users]

    a) In this question, student is required to explain implications for designing features and controls of a single page for keyboard-only users. Students need to state that keyboard-only users should be able to tab to all links, buttons, form elements, etc., when interacting within a single webpage; these users must be able to activate all links and buttons with the enter key and/ the space bar. Keyboard-only users must be presented with an alternative/equivalent keyboard event handlers for mouse hover features. Furthermore, in times when items are hidden from sighted users (such as drop-down menus), keyboard-only users should also not be able to tab to the hidden items (these items must be unavailable to the keyboard-only users until activated by the user or by the script) and then when a popup dialog box appears the keyboard focus must go to the dialog box only. When the dialog box closes, the focus must go back to the original control that activated the dialog box for the user to interact. Lastly, Custom JavaScript widgets should follow the ARIA Authoring Practices for keyboard behaviours. Students can refer to the WCAG 2.0 'Keyboard: Understanding 2.1.1' specification and examples when answering this question, available at https://www.w3.org/TR/UNDERSTANDING-WCAG20/keyboard-operation-keyboard-operable.html

(5 marks)

    b) Assistive technology users (blind and people with physical disabilities) must not be trapped in content meaning that Keyboard-only users must be able to get into and out of all contents and JavaScript widgets such as a calendar widget. This question refers to the WCAG 2.0 'No Keyboard Trap: Understanding 2.1.2' specification, available at https://www.w3.org/TR/UNDERSTANDING-WCAG20/keyboard-operation-trapping.html.

(5 marks)

c) *When the 'Visual Focus Indicator' is turned off in the CSS, keyboard users will not be able to see which element has the keyboard focus e.g. online form and date picker. Students may use definitions and examples from the WCAG 2.0 'Focus Visible: Understanding 2.4.7' specification, which is available at* https://www.w3.org/TR/UNDERSTANDING-WCAG20/navigation-mechanisms-focus-visible.html

(5 marks)

d) *The tab/reading order of webpages should match the visual order of contents programmatically as screen reader software will read through the entire page i.e. will start at the first element in the DOM (Document Object Model) and proceed until the last element in the DOM. Hence, screen reader users can get confused or disoriented when assistive technology software reads the content in the wrong order or when alternate style sheets or other formatting changes are applied. It is for this reason that developers need to make sure the DOM reading order is logical after applying CSS attributes such as float, margin, padding, relative positioning, and absolute positioning by either looking at the DOM directly, by disabling the styles in the browser, or by reading through the web page with a screen reader. This issue is discussed in WCAG 2.0 'Meaningful Sequence: Understanding 1.3.2' specification, available at* https://www.w3.org/TR/UNDERSTANDING-WCAG20/content-structure-separation-sequence.html

(5 marks)

e) *When opening a link it is best practice to open it in the same window or tab where the user currently is as screen reader users, screen magnifier users, and users with certain cognitive impairments can become disoriented when they are taken to a new window and could find it almost impossible to return back to the original window or tab. Alternatively, if the developer chooses to open a link in a new window, an alert message should be included to inform assistive technology users that by clicking on this button or link they will be directed to a new window/tab. This technique relates to WCAG 2.0 'Understanding Guideline 3.2 (Predictable)' specification available at* https://www.w3.org/TR/WCAG20-TECHS/G200.html

END OF EXAMINATION