BCS THE CHARTERED INSTITUTE FOR IT

BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 5 Diploma in IT

SOFTWARE ENGINEERING 1

Friday 21st April 2023 - Afternoon

Answer **any** FOUR questions out of SIX. All questions carry equal marks.

Time: TWO hours

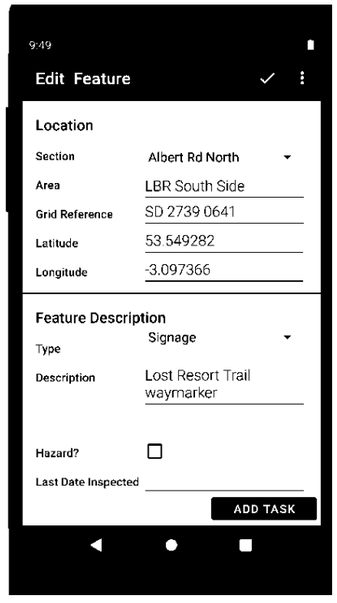
Answer any Section A questions you attempt in Answer Book A
Answer any Section B questions you attempt in Answer Book B

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

Calculators are NOT allowed in this examination.

Case Study for Questions A1 and A2

Case Study: Sandyhills Nature Reserve Android App



This case study is used in questions A1 and A2

Sandyhills Nature Reserve is part of a larger organisation. The Area Manager has asked the rangers at the reserve to survey and record all man-made and other significant features on the reserve on a regular basis.

The rangers have requested development of an Android App to help record the location of various features on the reserve (e.g., fence, path, pond, way marker, bench, boardwalk, gate).

Pairs of volunteer rangers carry out regular inspections of the features on the reserve, recording the date, who inspected the feature and whether it is a hazard.

The system also tracks work tasks, which require action by staff rangers. These can be a result of hazards recorded during feature inspection or other necessary work (e.g., Repair boardwalk, cut back bushes). A task has a priority and description, together with opening and completion dates and the name of the staff ranger completing the work.

The reserve is divided into sections, which are subdivided into areas. Each Feature is described by its type (e.g., Signage, Bench, Path), Location (Section, Area, Grid reference and Latitude/ Longitude (GPS)). The Grid reference is calculated from the GPS reference. Data is stored locally on the smartphone and synced to a cloud database.

One sample screen shot from a prototype is shown above.

B6.

a) You have been asked to estimate the total cost of ownership for various enterprise level server platforms so that a comparison of lifetime costs can be made. Explain the following four factors that can be considered in making your cost estimates.

   i) Service and support expenses in relation to administration and warranty of each part of the server platform;

   ii) Scalability expenses for the lifetime of the server platform;

   iii) Risk expenses associated with the cost of insurance to mitigate risks;

   iv) Operation expenses concerned with downtime and failures.

(16 marks)

b) Explain Parkinson's Law and describe how it can help to identify potential problems in the following three parts of a project plan:

   i) Activity duration in the schedule using an estimating by analogy technique;

   ii) Controlling the start and end times of activities in a project schedule;

   iii) Resource allocation throughout the project schedule.

(9 marks)

END OF EXAMINATION

Section A
Answer Section A questions in Answer Book A

A1.

a) Software Engineering is guided by a collection of core principles that provide a systematic basis for effective software engineering methods.

   Explain clearly what each of the following design principles means and why it is important. Use examples to illustrate your answer.

   i) Abstraction;

(3 marks)

   ii) Separation of Concerns;

(3 marks)

   iii) Modularity.

(3 marks)

b) Class Diagrams are often used in software engineering. Explain what a class diagram represents, together with its purpose and benefits.

(6 marks)

c) Refer to the case study on page 2.

   Draw a class diagram using UML to represent the system described in the case study. The specification is brief, so you should list any assumptions you make. You should clearly identify attributes for **all** classes and methods for **TWO** classes in your model.

(10 marks)

[Turn Over]

A2.

Refer to the case study on page 2.

a) Explain clearly the difference between validation and verification. Use an example from the case study to illustrate your answer.

(6 marks)

b) Traceability is an important concept in system development.

i) Discuss what traceability means and why it is important.

(5 marks)

ii) By using an example from the case study, explain how traceability could be demonstrated.

(4 marks)

iii) Describe a mechanism which could be used to determine whether the requirements of a project are being met and explain how you would make use of it.

(5 marks)

c) Process visibility is considered important in software engineering. Explain what process visibility means and discuss why it is important.

(5 marks)

A3.

Achieving a high level of reuse is arguably the hardest goal to accomplish in developing a software system.

a) Discuss the benefits and difficulties of software reuse. You should provide a clear justification for each of your stated benefits/ difficulties.

(8 marks)

b) Application Frameworks are one approach to software reuse.

i) Explain in detail the key features of an Application Framework and provide an example.

(8 marks)

ii) One of your colleagues says that "A Framework is nothing more than a library of commonly used classes". Discuss this statement.

(5 marks)

iii) Describe briefly **TWO** other alternative approaches to reuse.

(4 marks)

Section B
Answer Section B questions in Answer Book B

B4.

a)

i) Describe **each** of the five stages of the Waterfall model of software development processes.

ii) Give **TWO** examples of projects which would suit the Waterfall model of software development.

(13 marks)

b)

i) Describe the evolutionary prototyping model of a software development process and state the type of development project to which this is most suited.

ii) Explain **TWO** disadvantages in following an evolutionary prototyping model in a software development project.

(12 marks)

B5

a) Describe the following two testing techniques:

i) Black-box testing;
ii) White-box testing.

(6 marks)

b) Explain the purpose of Grey-box testing.

(4 marks)

c)

i) Explain the processes involved in performing a typical usability test.
ii) Describe a key benefit of usability testing.

(9 marks)

d) Explain what security testing is and state the type of system that this testing is appropriate for.

(6 marks)

[Turn Over]