

(25 Marks)

Question 1.

Question 1a. (5 marks)

In the Swift programming language, explain the concept of an *optional variable*. In particular, describe its purpose and how it is declared. Also explain the concept of *forced unwrapping*. Illustrate your answer with code where appropriate.

Question 1b. (10 marks)

Describe the advantages of using a cloud based solution when hosting a server side for your mobile application. Describe how third party services might simplify this process.

Question 1c. (10 marks)

Write a Swift class that represents a line. A line's endpoints are represented by four variables, $p1_x$, $p1_y$, $p2_x$ and $p2_y$. Provide an initialiser for the class to configure these values at instantiation. Also provide a method to return the length of the line using the Euclidean formula for the distance between two points:

$$\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

Finally, add a method that returns $p3_x$ and $p3_y$ which represent the coordinates of the midpoint of the line. These values are calculated as follows:

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Question 2.

(25 Marks)

Question 2a. (5 marks)

Briefly describe five techniques to improve the energy efficiency of your mobile applications.

Question 2b. (10 marks)

In the context of implementing a Table View, describe the purpose of each of the following: *Table View*, *Table View Controller*, *Table Cell*, *delegate* and *data source*.

Question 2c. (10 marks)

Describe the steps required to pass a string between two views using a segue. Where appropriate, illustrate your answer using code.

Question 3.

(30 Marks)

Question 3a. (5 marks)

What is an ad-hoc deployment? What constraints apply to an ad-hoc deployment? Describe the steps taken to create an ad-hoc provisioning profile.

Question 3b. (10 marks)

Describe the methods called when a view's visibility changes. Explain the purpose of each method.

Question 3c. (15 marks)

Describe - in detail - the general architecture of a service that is capable of sending notifications to a mobile application using Apple Push Notification service (APNs).