

**UNIVERSITY OF SWAZILAND**

**Faculty of Science**

**Department of Computer Science**

**MAIN EXAMINATION 2009**

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**Title of paper: SOFTWARE ENGINEERING – II**

**Course numbers: CS452**

**Time allowed: 3 hours**

**Instructions: Answer question 1 and any 4 of the remaining 5 questions. Each question carries 20 marks.**

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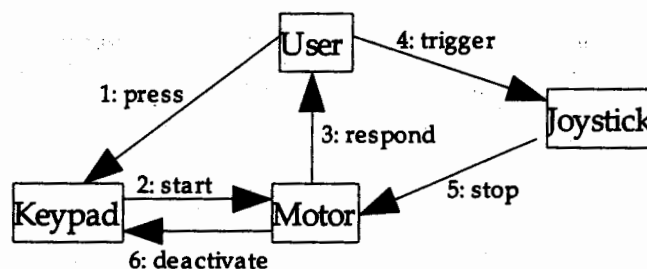
## Question 1

An alarm clock application is needed that will allow the user to set a date and time at which an alarm will be sounded. Furthermore, it will allow the user to select from a number of pre-set alarm sounds.

- a) State any 2 use cases of this application. [2]
- b) Present an object oriented design for this application in the form of a detailed UML class diagram. In addition, write brief notes on the main classes, relations, attributes and behaviours shown in the class diagram. [8]
- c) Draw UML sequence diagrams for each of the use cases you have identified in part a). [4]
- d) Draw a labelled sketch of the window(s) used and the components/widgets they may contain. In addition, write brief notes on the purpose and ease-of-use of each component sketched. [6]

## Question 2

- a) Explain any 3 advantages of object oriented analysis over other methods of analysis. [6]
- b) With the aid of examples, distinguish between each of the following pairs of relations in object oriented modelling:
  - i. Whole-part and member-of. [3]
  - ii. Inheritance and association. [3]
- c) What are CRC cards and how may they be used in object oriented analysis? [4]
- d) Draw a UML sequence diagram that is equivalent to the following collaboration diagram: [4]



### Question 3

- a) Give an account of any 3 design patterns apart from Model-View-Controller (MVC). [9]
- b) Define the 3 components of the MVC pattern. In addition, describe the most important messages sent between the components. [6]
- c) Suppose that the MVC pattern is to be employed in designing a desktop calculator application. The calculator is required to support 2 modes of operation:
- In 'simple' mode, a few basic arithmetic operations (add, divide, etc.) are provided to the user. Results are displayed at 10 digits precision.
  - In 'advanced' mode, additional operators (sine, log, etc.) are available. Results are displayed at 16 digits precision.

Describe the specific responsibilities of each MVC component in this application. [5]

### Question 4

- a) Distinguish between software engineering workbenches and tools. [2]
- b) Explain any 2 reasons for using version control tools. [4]
- c) Distinguish between the following pairs of concepts in relation to version control systems:
- i. Checkout and commit. [2]
  - ii. Reserved and unreserved checkout. [1]
  - iii. Version numbers and symbolic tags. [2]
- d) Explain the main purpose of build configuration tools such as 'Make'. [2]
- e) Explain the term 'dependency graph' in relation to build configuration. [2]
- f) With the aid of an example Makefile (of about 4 lines), explain the general structure of Makefiles. [5]

### Question 5

- a) Consider the statement: 'In user interfaces, learnability is often at odds with power.'

What do you understand by the 2 underlined words? In addition, explain the overall meaning of the statement. [5]

- b) Explain any 3 common guidelines for the design of good user interfaces. [6]

- c) What is meant by 'view hierarchy' in Graphical User Interfaces (GUIs)? [2]

- d) In relation to any GUI programming toolkit you have used, explain the following in general terms:

i. How the view hierarchy may be defined without explicit programming. [3]

ii. How one user-interface component can be made to respond to an event occurring at another component (e.g. a window closing in response to the click of a button.) [4]

### Question 6

- a) Software quality can be viewed from several distinct perspectives. Define any 2 of the perspectives identified by Garvin. [2]

- b) In relation to McCall's taxonomy of quality attributes:

i. Distinguish between quality factors and quality criteria. [2]

ii. Assume that a certain spreadsheet application suffers from low quality with respect to 5 factors: correctness, reliability, efficiency, integrity and usability. For each of these 5 negative factors, give a practical example of how it might be observed by users of the spreadsheet. [5]

iii. Explain reasons for stating that:

• 'the *maintainability* factor impacts positively on *correctness*' and

• 'maintainability is negatively impacted by *efficiency*.' [4]

i. Explain any 2 weak points of McCall's taxonomy. [4]

- c) Describe the goals of software quality assurance. [3]