



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE – SOFTWARE ENGINEERING

SSE 310: EMBEDDED SYSTEMS ANALYSIS AND DESIGN

DATE: Friday 13th April, 2012

TIME: 8.00 a.m. – 10.00 a.m.

INSTRUCTIONS

Attempt question 1 in SECTION A and any other 2 in SECTION B questions.

SECTION A: 30 Marks

Question 1

- a) Define the following terms (10 marks)
- i) Embedded system
 - ii) HOOD
 - iii) Generalization
 - iv) Aggregation
 - v) Scalability
- b) Most programmers develop systems for organizations which eventually don't work as expected. Briefly explain reasons why a software can fail (6 marks)
- c) Differentiate between : (4 marks)
- i) Software engineering and computer science
 - ii) Software engineering and Systems engineering
- d) You have been approached by an intern student in one of the most established international aviation companies who wants to know more concepts about modern embedded software engineering techniques. Explain how will you assist him understand the concept (8 marks)

- e) Using an employee object with a class diagram illustrate how this object can be represented. (2 marks)

Question 2

- a) Using a diagram, briefly describe a Petri-net (2 marks)
- b) Using a Petri-net illustrate the difference between a primitive and non-primitive event (4 marks)
- c) Using a real time control system illustrate the general model of interaction between a sensor and an actuator (6 marks)
- d) Explain all activities involved in a real system design process (8 marks)

Question 3

- a) Consider the problem below of a petrol (gas) pump
- The fuel delivery system is designed to allow unattended operation.
 - The buyer inserts a credit card into a card reader built into the pump. This causes a transition to a reading state where the card details are read and the buyer is then asked to remove the card.
 - Removal of the card triggers a transition to validating state where the card is validated.
 - If the card is valid, the system initializes the pump and when the fuel hose is removed from its holster, transition to the delivering state, where it is ready to deliver fuel.
 - Activating the trigger on the nozzle causes fuel to be pumped; this is stopped when the trigger is released.
 - After the fuel delivery is complete and the buyer has replaced the hose in its holster, the system moves to a paying state where the user's account is debited. After payment, the pump software returns to the waiting state.
- i) Draw a State machine model of a petrol(gas) pump for the above scenario (10 marks)
- b) Using relevant examples describe UML and five ways that it can be represented (10 marks)

Question 4

- a) Explain why distributed software systems are more complex than centralized software systems where all functionality is implemented on a single computer. (6 marks)
- b) Using a remote procedure call, explain how middleware coordinates the interaction of computers in a distributed system. (8 marks)
- c) Differentiate between a fat-client and a thin-client approach to client-server systems architectures. (6 marks)

Question 5

- a) Describe FIVE types of system models that are used in system development (10 marks)
- b) Why are general purpose operating systems, such as Linux and Windows, not suitable as real-time system platforms? Use your experience of using- general purpose system to help answer this question (4 marks)
- c) Describe THREE scenarios where Embedded software engineering is applied day to day life (6 marks)