



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2011/2012

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN COMPUTER ENGINEERING

SCE 512: EMBEDDED SYSTEMS

DATE: THURSDAY, 12TH APRIL 2012

TIME: 4.30 P.M – 6.30 P.M

INSTRUCTIONS:

ATTEMPT QUESTION 1 AND ANY OTHER 2 QUESTIONS

Question 1:

- a) Briefly explain the following concepts as used in embedded systems (10marks)
 - i) prefetch queue
 - ii) interleaving
 - iii) task
 - iv) processes
 - v) subroutine
- b) Describe any 3 components of an embedded system (6 marks)
- c) During the design of an embedded system a designer might decide to incorporate debug tools in the design. Explain four reasons why this maybe appropriate (8 marks)
- d) Microprocessors include hardware for memory management. Explain the following features of memory management (6 marks)
 - i) memory protection
 - ii) write protection
 - iii) relocation

Question 2:

- a) Outline and explain the four states of a task (8 marks)
- b) Outline and explain four preemptive scheduling algorithms used in embedded systems (8 marks)
- c) There are circumstances that would necessitate the use of microprocessors or microcontrollers when designing an embedded system instead of using hardware systems/circuits. Describe 4 considerations would favour microprocessors or microcontrollers. (4 marks)

Question 3

- a) Using appropriate illustrations describe the Von neuman Architecture and contrast it with the Harvard architecture on how data and instructions are passed between the processor and the memory (8 marks)
- b) Real time operating systems typically support different functions. discuss the following functions of RTOS (6 marks)
 - 1. Multitasking
 - 2. Communication
 - 3. Memory management
- c) Explain the following concepts of the Real time operating system (6 marks)
 - i) hard real-time
 - ii) soft real-time
 - iii) super hard-real time

Question 4

- a) There are a number of reasons why a developer might choose a PC platform for the development of an embedded system. Outline and explain any of these 3 reasons (6 marks)
- b) Explain four factors that you would consider when selecting a communication bus and protocol for a multiprocessor system (8 marks)
- c) Interrupts are important in aiding the execution of tasks in an embedded system. Discuss this statement illustrating three advantages of interrupts (6 marks)

Question 5

- a) Explain the following software architectural frameworks as used in embedded software (4 marks)
 - i) Single polling loop
 - ii) State machine
- b) Many embedded systems have their code written in assembler language as opposed to high level languages. Give three reasons why this maybe so. (6 marks)
- c) The software specification document is considered very important during the development of any software. Give five reasons to justify the use of this document (10 marks)