

*Second Semester 2013*

**EMBEDDED SYSTEMS AND REAL-TIME DIGITAL SIGNAL  
PROCESSING**

**( ENGN8537)**

*Writing period : 2.5 Hours duration*

*Study period : 20 Minutes duration*

*Permitted materials :*

- *A4 page (one sheet) with notes on both sides*
- *Calculator - non-programmable*
- *Paper-based Dictionary, no approval required (must be clear of ALL annotations)*

*You must attempt to answer all of Section A **and** B; and one of Sections C **or** D.  
If both Sections C and D are answered, both will be marked and the highest scoring section  
counted towards the final grade.*

*Total score out of 60 (60% of final grade)*

*All questions to be completed in the script book provided.*

### SECTION C: Case Study 1, Mobile Telephone (20 marks)

Answer this section OR Section D

Consider a modern “Smartphone” type mobile telephone such as the iPhone shown below



1. Sketch a System Architecture Diagram for the device, showing likely interfaces between major components in the device, as well as between the device and the environment. Your diagram is not expected to exactly match Apple's, but must state and justify any guesses or assumptions. (8 marks)
2. Which of these interfaces are likely to conform to industry standards and which are likely to be proprietary? Justify your answer. (2 marks)
3. Pick **four** elements of the diagram that are likely to be subject to some real time constraints. List each as 'hard', 'firm' or 'soft' and justify each answer with a sentence or short paragraph (4 marks)
4. The underlying operating system in the phone may have device drivers that are either interrupt-driven or polling.
  - a. Briefly describe the difference between the two methods (1 mark)
  - b. Pick **two** devices that the phone's processor would have to interface with. Are they more likely to be using polling or interrupts? Justify your answer with a sentence or short paragraph. (2 marks)
5. List all the different types of memory device you might expect to find in the phone. For each one, write a sentence or two describing what the purpose of that memory is and what memory technology you would most likely use to implement it. (3 marks)