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Family Name					
Given Name/s					
Student Number					
Teaching Period	Semester 1, 2019				

HIT332 – Embedded and Mobile Systems	DURATION	
	Reading Time:	10 minutes
	Writing Time:	180 minutes
INSTRUCTIONS TO CANDIDATES		
<p>1.1 The examination has twenty (20) questions 1.2 Answer all questions. 1.3 Note that questions ARE NOT of equal value. 1.4 Read ALL questions carefully.</p>		
EXAM CONDITIONS		
<p>You may begin writing from the commencement of the examination session. The reading time indicated above is provided as a guide only.</p>		
This is a RESTRICTED OPEN BOOK examination		
Any non-programmable calculator is permitted		
No handwritten notes are permitted		
Hard copy, unannotated English translation dictionary only		
ADDITIONAL AUTHORISED MATERIALS	EXAMINATION MATERIALS TO BE SUPPLIED	
Lecture Notes (Unannotated) Lecture Textbook/s (Unannotated)	1 x 20 Page Book 1 x Scrap Paper	

**THIS EXAMINATION IS PRINTED
DOUBLE-SIDED.**

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Question 1 (6 marks)

Question 1.1 (4 marks)

List some possible approaches to improve the performance of an embedded system.

Question 1.2 (2 marks)

How would these approaches affect other design metrics?

Question 2 (6 marks)

Question 2.1 (3 marks)

How does Moore's law affect the design metrics of embedded systems?

Question 2.2 (3 marks)

Would Moore's law affect some design metrics more than other design metrics? Explain your answer.

Question 3 (7 marks)

Question 3.1 (4 marks)

What questions would you ask before you decide whether to use a general purpose processor or a custom single purpose processor?

Question 3.2 (3 marks)

Are there any disadvantages of using both single purpose processors and a general purpose processor in a single embedded system? Explain your answer.

Question 4 (5 marks)

You have graduated from CDU and have a job in development of embedded systems. What new developments do you expect in embedded systems in the next ten years?

Question 5 (3 marks)

Give two examples of error detection methods and explain their limitations.

Question 6 (2 marks)

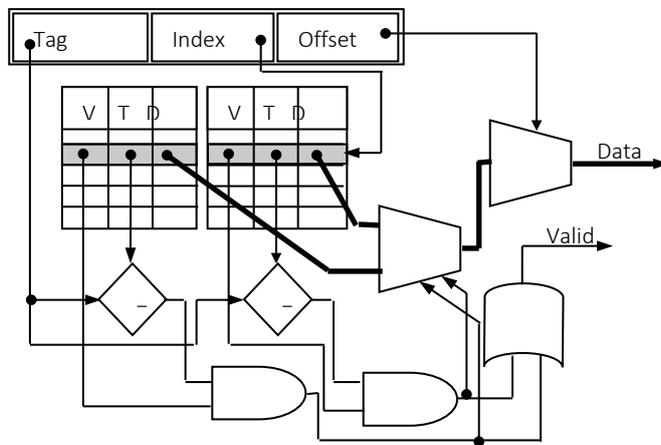
Why are NOR gates more commonly used than OR gates?

Question 7 (3 marks)

What are the most common “physical layers” for wireless communication?

Question 8 (4 marks)

The diagram below shows a type of cache. What is this type of cache called and what are the advantages of this type of cache compared to other types of cache?



Question 9 (6 marks)

Question 9.1 (3 marks)

What is the difference between DRAM and SRAM?

Question 9.2 (3 marks)

What is PSRAM? What is NVRAM?

Question 10 (3 marks)

Draw the timing diagram for a bus protocol that is handshaked, nonaddressed and transfers 8 bit of data over a 4-bit data bus.

Question 11 (3 marks)

What would you do if the location for the interrupt service routine does not have enough space for all the commands which need to be executed?

Question 12 (6 marks)

Question 12.1 (3 marks)

Explain why time to market is a more important design criteria for camera's now than it was 25 years ago.

Question 12.2 (3 marks)

What are the requirements for memory used to store pictures in a digital camera? Explain why the type of memory that is most commonly used is suitable for this application?

Question 13 (6 marks)

Question 13.1 (3 marks)

Why is arbitration necessary?

Question 13.2 (3 marks)

You have to decide whether you want to use a priority arbiter or not. What criteria would you use to make this decision?

Question 14 (6 marks)

Question 14.1 (3 marks)

What is the purpose of an interrupt pin?

Question 14.1 (3 marks)

If an interrupt can be masked why would you use an interrupt at all?

Question 15 (3 marks)

How can a design for an embedded system be tested?

Question 16 (8 marks)

Question 16.1 (2 marks)

What is image compression?

Question 16.2 (3 marks)

JPEG encoding provides for more than one method of compression. Briefly (in a few sentences) explain the essence of each of these methods.

Question 16.3 (3 marks)

How does each of the methods mentioned above affect the quality of the image?

Question 17 (8 marks)

Question 17.1 (3 marks)

Is Flash memory a suitable memory choice for cache? If yes, explain why. If no, explain why not.

Question 17.2 (2 mark)

List in order of importance, the design metrics which are affected by the use of cache.

Question 17.3 (3 mark)

Is it possible that direct mapping can result in significantly longer execution times than fully associative mapping? Explain your answer.

Question 18 (3 marks)

Give an example of a parallel protocol. Under what circumstances is parallel communication a better option than serial communication?

Question 19 (4 marks)

Question 19.1 (2 marks)

Why are LCD controllers often used in embedded systems?

Question 19.2 (marks)

Can this function be fulfilled by a general purpose processor? If no, explain why not. If yes, why would a designer use an LCD controller instead of a general purpose processor?

Question 20 (8 marks)

The College of Engineering, IT and Environment is starting a Digital Plover Monitoring project. The purpose is to monitor the behaviour of the plovers on CDU campus, particularly during the breeding season. Students and staff from all area's of the college will be involved in the collection of data. One researcher believes plover's perception of themselves and their environment has evolved from that of dinosaurs and still has large similarities, or to put it in another way: plovers think they are still dinosaurs which is why they don't build their nests in trees and why they attack creatures much larger than themselves.

You are asked to develop a portable digital plover monitor system which will help to keep track of

- the location of the plovers
- whether the plovers are breeding
- the number of young plovers being born on campus
- plover attacks

Students and staff of the college should have a portable device which they can take with them around the university. They need to be able to enter the number of plovers they see and the time and location should then also be automatically recorded. There should be a white button to record the presence of eggs and blue or pink one to report young plovers. The devices should communicate with a central system where all the information will be combined. Plover attacks should be reported by pressing a red button and when this happens a red light should be turned on on all portable plover monitors within 300 m of the attack.

Question 20.1 (4 marks)

Briefly describe your approach to designing such a system.

Question 20.2 (4 marks)

List the technical considerations for this system related to

- processor(s)
- memory
- communication