



AUSTRALIAN COMPUTER SOCIETY

(Incorporated in the A.C.T.)

Diploma of Information Technology

June 2009



COMPUTER ORGANISATION

Complete this cover sheet and attach securely to the front of your answers.

FAMILY NAME

GIVEN NAME(S)

ACS EXAMINATION NUMBER _ _ _ _ _

PAPER: Computer Organisation

| | Max. Marks | Examiners Marks |
|--|-------------------|-----------------|
| Question 1. <i>Not relevant to a specific Unit of Competency.</i> | 10 | |
| Question 2. <i>Not relevant to a specific Unit of Competency.</i> | 10 | |
| Question 3. <i>Not relevant to a specific Unit of Competency.</i> | 10 | |
| Question 4. <i>Not relevant to a specific Unit of Competency.</i> | 10 | |
| Question 5. <i>Not relevant to a specific Unit of Competency.</i> | 10 | |
| Question 6. <i>Not relevant to a specific Unit of Competency.</i> | 10 | |
| Question 7. <i>Not relevant to a specific Unit of Competency.</i> | 10 | |
| Question 8. <i>Not relevant to a specific Unit of Competency.</i> | 10 | |
| Question 9. <i>Not relevant to a specific Unit of Competency.</i> | 10 | |
| Question 10. <i>Not relevant to a specific Unit of Competency.</i> | 10 | |
| | Total Marks | |



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Time allowed : Reading 15 minutes
 Writing 3 hours

1. This exam paper has 10 questions, and each question is worth 10 marks. Total marks for the exam paper is 100.

Candidates should schedule their time according to the marks allocated to the questions and sub-questions.

2. To pass the exam, a candidate must gain at least 50 marks for the paper overall.

Candidates should attempt every question.

3. Candidates should write their Exam Number at the TOP of every answer page.

4. All answers must be written on this paper and should not exceed the space provided.

No additional paper will be supplied.

5. All answers must be written in INK.

Candidates should write clearly and neatly.

6. Candidates may bring to this examination the following; pens, pencils and other writing and drawing equipment, plus any paper-based materials either written or printed.

Candidates must not bring to this examination electronic devices including, but not limited to; calculators; notebook, handheld or PDA computers; mobile or cellular telephones; or other data storage and/or communications devices.

Question One

What is the difference between a computer's storage mechanism versus its computing mechanism?

Explain with examples. **(10 marks)**

Question Two

Convert the decimal number **14** into hexadecimal number and binary numbers. You must show the working process of this conversion. **(10 marks)**

Question Three

Simplify the following logic expression:

$$E = AB(B+C)' + (A+B')' + C(A'+B)'$$

(10 marks)

Question Four

- (a) Consider a microprocessor, with a 32-bit external data bus, driven by 1,200-MHz input clock. Assume that this microprocessor has a bus cycle whose minimum duration equals eight input clock cycles. What is the maximum data transfer rate that this microprocessor can sustain? Your answer *must* be supported by all the steps you use in arriving at the answer. **(10 marks)**

Question Five

Show how computers carry out the operation $(11_{10} - 21_{10})$ using 2's complement, assuming 8 bits are used to represent each decimal number (11_{10} and 21_{10} indicate decimal numbers of 11 and 21 respectively). You must show how each number is represented, the working process and the interpretation of the result.

(10 marks)

Question Six

The addressable width of a computer processor is 32 bits. How many addressable locations does the processor have? Ensure your answer is fully justified (*Note: simply writing the answer will not attract full marks*) **(10 marks)**

Question Seven

A computer has a cache, main memory, and a disk used for virtual memory. If a word is in the cache, 32 nanoseconds are required to access it. If it is in main memory but not in the cache, 240 nanoseconds are first needed to load it into the cache, and then the reference is started again. If the word is not in main memory, 400 nanoseconds are needed to transfer it to the cache and the reference is started again. If the cache hit ratio is 50% and the main memory hit ratio is 40%, what is the average access time? **(10 marks)**

Question Eight

- (i) In the operation of a computer's CPU, what are the main stages of an instruction cycle? (ii)
Explain how instruction pipelining can improve the efficiency of the CPU (10 marks)

Question Nine

(i) Explain how to calculate the storage requirement of a bit-mapped graphics/image. (ii) What is the storage requirement of a bit mapped image of 1000 x 800 pixels with 24 bits per pixel? **(10 marks)**

Question Ten

“DRAMs are normally cheaper and larger in storage size than SRAMs. So SRAMs are not used in most computers.” (i) Is this statement correct? (ii) Justify your answer. **(10 marks)**

End of Exam