University of Swaziland

Department of Computer Science

Supplementary Examination

July 2012

TITLE OF PAPER:	COMPUTER ORGANISATION I
COURSE NUMBER:	CS 241
TIME ALLOWED:	3 HOURS
INSTRUCTIONS:	ANSWER **ONE** QUESTION FROM **SECTION A** ANSWER **THREE** QUESTIONS FROM **SECTION B**

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SECTION A

Question 1 (COMPULSORY)

A. Explain each of the following terms:
   i. Translator [2]
   ii. Interpreter [2]
   iii. Virtual machine [2]
   iv. What is the difference between translation and interpretation? [2]

B. Draw a clearly labelled diagram of the CPU showing the following: ALU, accumulator, I/O. [8]

C. Explain Moore's Law with an example from each of the following:
   i. Number of transistors in a CPU [2]
   ii. Memory capacity [2]

D. Convert the integer 2063 into the following radix:
   i. bin, [2]
   ii. hex. [3]

SECTION B (ANSWER ANY THREE QUESTIONS FROM THIS SECTION)

Question 2

A. The inequality $(m+ r +1) \leq 2^r$ determines the limit of check bits needed to correct single-bit errors.
   i. Create a table for the hamming codes for the following message sizes indicating: message length, codeword length, number of check-bits and the percentage of bits wasted for the following word sizes: 16, 32, 128, 320, 512, [15]
   ii. Construct the Hamming code for the following 16-bit message 1111000010101110. [5]

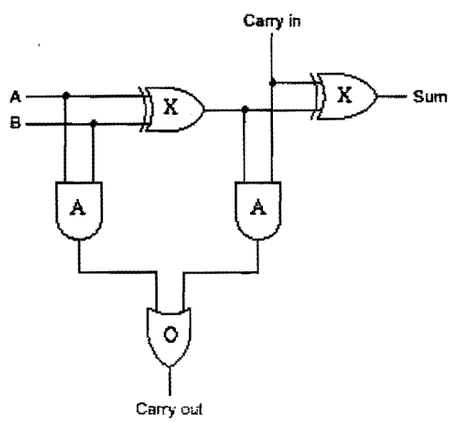
B. Define the principle that determines the success of cache memory. [3]

C. Define cache hit ratio, miss ratio. [2]

Question 3

A. Draw a half adder [5]

B. Describe a multiplexer with the aid of a diagram [5]



C. The above circuit diagram shows a *full adder*. Write out a truth table showing values of the *sum* and *carry out* for all the possible combinations of *A*, *B* and *carry in*.

The gates marked *X* are exclusive or (XOR) gates; those marked *A* are AND gates; the gate marked *O* is an OR. [10]

D. Briefly describe the following storage devices: CDROM, DVD [5]

Question 4

A. Distinguish between synchronous and asynchronous buses [9]

B. Describe with the aid of an illustration:

i) Decoder [8]
ii) SR latch [8]

Question 5

A. How long does it take to read a disk with 10,000 cylinders, each containing four track of 2048 sectors? First, all sectors of track 0 are to be read starting at sector 0, then all sectors of track 1 starting at sector 0, and so on. The rotation time is 10msec, and a seek takes 1msec between adjacent cylinders and 20msec for the worst case. Switching between tracks of a cylinder can be done instantaneously. [10]

B. To be able to fit 133 minutes worth of video on a single-sided single-layer DVD, a fair amount of compression is required. Calculate the compression factor required. Assume that 3.5 GB of space is available for the video track, that the image resolution is 720 x 480 pixels with 24-bit color, and images are displayed at 30 frames /sec.[10]

C. Represent the following number using 2's complement -120 [5]

END OF EXAM ---------- ---------- TOTAL: 100 MARKS