OLLSCOIL NA hEIREANN, CORCAIGH

THE NATIONAL UNIVERSITY OF IRELAND, CORK

COLAISTE NA hOLLSCOILE, CORCAIGH

UNIVERSITY COLLEGE, CORK

Summer Examinations 2011

CS2507 Computer Architecture

Dr C. Shankland

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Total Marks: 80

Answer TWO QUESTIONS

TIME ALLOWED: 1.5 hours

QUESTION 1 (40 Marks)

(a) Briefly explain the idea of orthogonality as it relates to instruction sets. Give examples from the instruction set of the Intel 8086 processor to illustrate whether that instruction set is orthogonal or otherwise. **5 Marks**

(b) Explain, with the aid of examples, the addressing modes implied, register, immediate, direct, register indirect. **10 Marks**

(c) List the registers visible at the ISA level in the Intel 8086 processor. Give a brief description of each register and its function. **12 Marks**

(d) Describe the memory organisation of the Intel 8086 architecture. Include accounts of register use in the formation of memory addresses. **13 Marks**

QUESTION 2 (40 Marks)

(a) Convert the following unsigned decimal numbers first to octal and from there to binary and hexadecimal, showing all workings: 63D, 1259D, 127D, 15D. **12 Marks**

(b) Convert the following signed decimal numbers to hexadecimal, using twos-complement representation with four hexadecimal digits in the final number: -63D, -1259D, -127D, -15D **12 Marks**

(c) Consider the IEEE 754 single-precision floating-point format.

(i) What are the advantages of using a biased exponent? **3 Marks**

(ii) Describe the IEEE 754 single-precision floating-point format. **7 Marks**

(iii) How would the number $0.1011 * 2^{-101}$ be represented in this format? **6 Marks**

QUESTION 3 (40 Marks)

(a) Write down the mnemonic you use to remember the resistor colour code. Four resistors have coloured bands on the end-to-centre system that read as follows: Brown-Red-Brown, Orange-Orange-Black, Brown-Black-Orange and Blue-Grey-Red. What are their values? **10 Marks**

(b) Three resistors are connected in parallel. Their individual values are 20kΩ, 25kΩ and 35kΩ. What is the value of the combined resistance? **6 Marks**

(c) State Ohm's Law. A device is connected to the terminals of a battery. By measurement, the voltage across the device terminals is 12V and the current flowing in the circuit is 3A. What is the resistance of the device? What power is dissipated in this circuit? **9 Marks**

(d) A 50Hz AC source of 220V rms supplies a capacitor of 250μF connected in series with a 50kΩ resistor. Calculate the peak voltage value and the reactance of the capacitor. **6 Marks**

(e) What are the two mechanisms of conduction in semiconductors? Sketch the ideal IV characteristic of a pn junction diode. **9 Marks**