

North East University Bangladesh (NEUB)
Department of Computer Science and Engineering
Mid Semester Examination 2022
Course code: **CSE311** (Computer Architecture)
Total Marks: **30** | Time: 90 minutes

Answer any 3 questions.

Q1	<p>(a) What do you mean by Instruction and Instruction Set? What is ISA and Microarchitecture? Give examples if needed. Please mention the Fields and Field size for R-type, I-type and J-type instructions.</p> <p>(b) Briefly mention the meaning of the following MIPS instructions.</p> <p>(i) add \$s1,\$s2,\$s3</p> <p>(ii) lw \$s1,20(\$s2)</p> <p>(iii) andi \$s1,\$s2,10</p> <p>(iv) sltu \$s1,\$s2,\$s3</p> <p>(v) bne \$s1,\$s2,25</p>	5																												
Q2	<p>(a) Using 4-bit numbers using the multiplication algorithm, multiply $0010_{two} * 0011_{two}$.</p> <p>(b) Find out the decimal equivalent of the following floating-point binary number. Also represent this number in 64bit format.</p> <div> <table> <tr> <td>1</td> <td>01111110</td> <td>100000000000000000000000</td> </tr> </table> </div>	1	01111110	100000000000000000000000	5																									
1	01111110	100000000000000000000000																												
Q3	<p>(a) What is the assembly language statement corresponding to this machine instruction?</p> <p style="text-align: center;">00af8020hex</p> <p>(b) In the following code segment, f, g, h, i, and j are variables. If the five variables f through j correspond to the five registers \$s0 through \$s4, what is the compiled MIPS code for this C <i>if</i> statement?</p> <div> <pre>if (i == j) f = g + h; else f = g - h;</pre> </div>	5																												
Q4	<p>(a) A compiler designer is trying to decide between two code sequences for a computer. The hardware designers have supplied the following facts:</p> <table> <tr> <th></th><th colspan="3">CPI for each instruction class</th></tr> <tr> <th></th><th>A</th><th>B</th><th>C</th></tr> <tr> <td>CPI</td><td>1</td><td>2</td><td>3</td></tr> </table> <p>For a high-level language statement, the compiler writer is considering two code sequences that require the following instruction counts:</p> <table> <tr> <th></th><th colspan="3">Instruction counts for each instruction class</th></tr> <tr> <th>Code Sequence</th><th>A</th><th>B</th><th>C</th></tr> <tr> <td>C-1</td><td>2</td><td>1</td><td>2</td></tr> <tr> <td>C-2</td><td>4</td><td>1</td><td>1</td></tr> </table> <p>Which code sequence executes the most instructions? Which will be faster? What is the CPI for each sequence?</p> <p>(b) Suppose we have two implementations of the same instruction set architecture. Computer A has a clock cycle time of 250 ps and a CPI of 2.0 for some programs, and computer B has a clock cycle time of 500 ps and a CPI of 1.2 for the same program. Which computer is faster for this program and by how much?</p>		CPI for each instruction class				A	B	C	CPI	1	2	3		Instruction counts for each instruction class			Code Sequence	A	B	C	C-1	2	1	2	C-2	4	1	1	5
	CPI for each instruction class																													
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C-2	4	1	1																											

Q5	<p>(a) Draw a block diagram for Von Neumann Architecture.</p> <p>(b) List the five classic components of a computer system.</p> <p>(c) What is the stored program concept?</p> <p>(d) State Moore's law. According to the trend in device scaling historically observed by Moore's Law, the number of transistors on a chip in 2025 should be how many times the number in 2015?</p> <p>(e) The eight great ideas in computer architecture are like ideas from other fields. Match the eight ideas from computer architecture, "Design for Moore's Law", "Use Abstraction to Simplify Design", "Make the Common Case Fast", "Performance via Parallelism", "Performance via Pipelining", "Performance via Prediction", "Hierarchy of Memories", and "Dependability via Redundancy" to the following ideas from other fields:</p> <p>A. Assembly lines in automobile manufacturing</p> <p>B. Suspension bridge cables</p> <p>C. Express elevators in buildings</p>	<p>2*</p> <p>5 =</p> <p>10</p>
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$S_0, S_7, S = 16$
 f_0, f_9

10-
 11-
 12-
 13-
 14-
 15-
 16

$k = 9$
 $k_1 = 10$
 $k_2 = 11$
 $k_3 = 12$
 $k_4 = 13$
 $k_5 = 14$
 $k_6 = 15$
 $k_7 = 16$