



Daffodil International University
Department of Software Engineering
Faculty of Science & Information Technology
Midterm Examination, Spring 2024
Course Code: SE222 ; Course Title: Computer Architecture
Sections & Teachers: FBR, KBB, NJM, SS, SUP

Time: 1 Hour 30 Mins

Marks: 25

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	a) A 400-MHz processor was used to execute a benchmark program with the following instruction mix and clock cycle counts. <table border="1"><thead><tr><th>Instruction Type</th><th>CPI</th><th>Instruction Mix</th></tr></thead><tbody><tr><td>Arithmetic and Logic</td><td>1</td><td>60%</td></tr><tr><td>Load/Store with cache hit</td><td>2</td><td>18%</td></tr><tr><td>Branch</td><td>4</td><td>12%</td></tr><tr><td>Memory reference with the cache miss</td><td>8</td><td>10%</td></tr></tbody></table> Identify the effective CPI, MIPS rate from the table to execute program delivery.	Instruction Type	CPI	Instruction Mix	Arithmetic and Logic	1	60%	Load/Store with cache hit	2	18%	Branch	4	12%	Memory reference with the cache miss	8	10%	[Marks-5]	
Instruction Type	CPI	Instruction Mix																
Arithmetic and Logic	1	60%																
Load/Store with cache hit	2	18%																
Branch	4	12%																
Memory reference with the cache miss	8	10%																
	b) Assume that your processor is working with 6 I/O devices which are a keyboard, a portable disk, a pen drive, a headphone, a mouse, an audio system and a DVD - ROM with the priorities of 1, 2, 3, 4, 5, 6 and 7 in sequence. Label the multiple interrupt handling with proper diagrams using the following cases. <u>Cases:</u> i. Processor first received a signal from pen drive at time $t=13$ unit ii. Then received another signal from the headphone at time $t=14$ unit iii. After that received the 3rd signal from the mouse at time $t= 15$ units. iv. Next Processor received the 4th signal from the portable disk at time $t= 16$ units. v. After the processor received the 5th signal from the audio at time = 17 units. vi. Next processor received the 6th signal from the keyboard at time = 19 unit vii. Finally, processor received the last signal from the DVD - ROM at time = 21 unit NB: Each task is continuous and can only be finished after handling the interrupts according to their respective priorities.	[Marks-5]	CLO-1 Level-1															

c)	Find the Hypothetical Processor Instructions from the generated figure.			[Marks-5]		
	Memory					
	400	13501	Here, 0001 = Load AC from memory 0010 = Add to AC from memory 0100 = Multiply to AC from memory 0101 = Store AC to memory 0110 = Divide to AC from memory			
	401	23502				
	402	63503				
	403	53503				
	404	43503				
	3501	005				
	3502	003				
3503	002					
2.	a)	Classify and briefly derive the main structural components of a GP processor			[Marks-4]	CLO-2 Level-3
	b)	Demonstrate the logical and physical cache diagram with explanations.			[Marks-3]	
	c)	Show the diagram of a typical Cache Read Operation.			[Marks-3]	