MODULE A SYSTEMS ARCHITECTURE · A3

Von Neumann architecture

Original practice questions · ~25 minutes · 20 marks · J277 spec 1.1.1

Name _____ Date _____

Instructions. Answer all questions in the spaces provided. The marks for each part are shown in brackets [ ]. The total for this worksheet is **20 marks**.

1

Total: 3 marks

A car park pay machine contains a CPU that uses Von Neumann architecture.

(a) State where the program instructions and the data are stored in Von Neumann architecture. **[1]**

(b) Describe the stored program concept. **[2]**

2

Total: 4 marks

The CPU in the pay machine has several registers.

(a) Complete the table by giving the missing register names and purposes. **[4]**

Register	Purpose
	Holds the address of the next instruction to be fetched.
MAR (Memory Address Register)	
MDR (Memory Data Register)	
	Holds the result of calculations carried out by the ALU.

3 **Total: 2 marks**

(a) Identify the **two** registers from Question 2 that hold a memory address. **[2]**

4 **Total: 5 marks**

Part of the pay machine's main memory is shown below.

Address	Contents
40	LOAD 45
41	ADD 46
42	STORE 47
45	250
46	150

(a) State the address of the location that holds the value 150. **[1]**

(b) The program counter holds 41. The next instruction is fetched.

(i) State the value the MAR will hold. **[1]**

(ii) State what the MDR will hold. **[1]**

(c) Explain the difference between an address and the data stored at that address. Use the memory table in your answer. **[2]**

5 Total: 3 marks

(a) Tick (✓) one box in each row to show whether each statement is true or false. If a statement is false, rewrite it so that it is true. **[3]**

Statement	True	False	Rewritten statement (if false)
The program counter counts how many programs are running.			
In Von Neumann architecture, data and instructions are held in the same memory.			
The MDR holds the address of the memory location being used.			

6 Total: 3 marks

The car park company changes its prices. A new program is sent to every pay machine. The hardware inside the machines is not changed.

(a) Explain how Von Neumann architecture allows the machine to run the new program without changing its hardware. **[3]**

Total for this worksheet: 20 marks