MODULE A SYSTEMS ARCHITECTURE · A3

Von Neumann architecture and the buses

Original practice questions · ~25 minutes · 20 marks · 0478 syllabus 3.1.2(a)

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 ticket machine at a railway station has a CPU with Von Neumann architecture. The CPU fetches instructions and data from random access memory (RAM).

(a) State **one** feature of Von Neumann architecture about where instructions and data are stored. **[1]**

(b) Identify **two** registers in the CPU that store an address. **[2]**

2

Total: 4 marks

(a) Complete the table by writing the name of the register that matches each description. **[4]**

Description	Register
Stores the data or instruction that has just been fetched from RAM	
Stores the instruction that is currently being decoded and executed	
Stores the address of the next instruction to be fetched	
Stores the result of a calculation carried out by the ALU	

3 **Total: 5 marks**

The CPU is connected to RAM by three buses: the address bus, the data bus and the control bus.

(a) Tick (✓) **one** box in each row to show which bus each statement describes. **[5]**

Statement	Address bus	Data bus	Control bus
Carries a read or write signal from the control unit			
Carries the location in RAM that the MAR is pointing to			
Carries an instruction from RAM to the MDR			
Only carries signals in one direction, from the CPU to RAM			
Carries a value from the MDR to be stored in RAM			

4 **Total: 5 marks**

The ticket machine needs to read the price of a ticket. The price is stored in RAM at address 0110 1100.

(a) State the name of the register that sends the address 0110 1100 onto the address bus. **[1]**

(b) Describe how the buses are used to read the price from RAM into the CPU. **[4]**

5 **Total: 3 marks**

(a) Explain why the data bus needs to carry data in both directions but the address bus only carries addresses in one direction. **[3]**

Total for this worksheet: 20 marks