Question 1: (20 marks)

a) Explain the Von Neumann machine, its major components, and their purposes. (Total 6 marks)

Von Neumann machine is the prototype for the general-purpose (1 mark) store-program computer. (1 mark)
ALU (1/2 mark): performing operations based on binary data (1/2 mark)
Memory (1/2 mark): storing both data and instructions (1/2 mark)
I/O Devices (1/2 mark): for input/output data (1/2 mark)
Control Unit. (1/2 mark): controlling the executions of program (1/2 mark)

b) What is the benefit of using multiple-bus architecture compared to single-bus architecture?

(Total 4 marks)

- reducing the propagation delay (2 marks)
- increasing the capacity for data transferring (2 marks)

c) What is the difference between DRAM and SRAM in terms of characteristics such as speed, size, power consumption and cost?

(Total 4 marks)

Speed (1 mark)	SRAM is faster than DRAM
Size (1 mark)	DRAM is more dense than SRAM
power consumption (1 mark)	DRAM requires periodic charge refreshing to maintain data storage which consumes power. SRAM don't
Cost (1 mark)	DRAM is less expensive than SRAM

d) What is the difference among EPROM, EEPROM, and flash memory, with regards to re-programmability?

(Total 6 marks)

EPROM: **All** the storage must be erased by ultraviolet radiation which **takes time** before a write (2 marks)
EEPROM: can be electrically written **without** erasing prior contents, **only** the bytes addressed are updated. (2 marks)
Flash**: the entire** storage can be electrically erased in **few seconds**. It's possible to erase blocks of memory rather than an entire chip. (2 marks)