Please complete Q1-Q14

- A programmable logic controller (PLC) is a self-contained microcomputer that is optimised for industrial control.
- The method selected to implement a digital system is likely to depend on its complexity. Simple systems might be produced using a handful of conventional gates, while more complicated arrangements might suggest the use of a gate array. Where considerable complexity is involved, it will often be necessary to use some form of VLSI device in the form of a logic array or microprocessor.

Exercises

26.1 Explain the principle of Moore's law.

26.2 Why is it unattractive to produce a VLSI device containing 1000 separate gates?

26.3 Explain what is meant by the term 'glue logic'.

26.4 What is meant by random logic?

26.5 Explain the terms 'uncommitted logic' and 'array logic'.

26.6 Explain the basic form of a programmable logic array (PLA).

26.7 Sketch a diagram showing how the PLA of Figure 26.2 could be programmed to implement the following logic functions:

$$X = A\bar{B}CD + \bar{A}B\bar{C}D + ABC\bar{D}$$

$$Y = \bar{A}B\bar{C}D + ABC\bar{D}$$

$$Z = A\bar{B}CD + ABC\bar{D}$$

26.8 How does a PAL differ from a PLA?

26.9 How many inputs and outputs are provided by a 20R6 PAL? What does the 'R' in the part name signify?

26.10 What is meant by an OTP part?

26.11 Describe the characteristics of a PEEL device.

26.12 How does a CPLD differ from an SPLD?

26.13 How does an FPGA differ from a CPLD?

26.14 Describe the process used to program a PLD for a given application.

26.15 What is a microprocessor?

26.16 Sketch a simple block diagram indicating the main elements of a computer and showing the information flow between them.

26.17 Explain what is meant by a single-chip microcomputer.

26.18 What is the addressing range of a computer that uses 22-bit addresses?

26.19 Explain why registers require three-state operation to be used on a computer bus.

26.20 Explain the difference between Von Neumann architecture and Harvard architecture.

26.21 What is the range of a 24-bit unsigned quantity?

26.22 What is the range of a 24-bit signed quantity?

26.23 Explain the terms 'instruction set', 'opcode' and 'operand'.

26.24 What is the difference between CISC and RISC?

26.25 Explain the function of the program counter register.

26.26 During the operation of a program, it is often useful to jump to a subroutine containing a program section that is used several times. At the end of the subroutine, the processor must return to the instruction following the jump to subroutine instruction. Explain how this may be achieved. Your solution should take into account the fact that subroutines can be nested, in that one can call another.

26.27 Explain the difference between multiplexed and non-multiplexed bus systems and describe how the full address bus is derived in the former.

26.28 Explain the meanings of the terms 'memory-mapped I/O', 'polling', 'program-controlled I/O', 'interrupt-driven I/O' and 'DMA'.

26.29 Compare and contrast the use of memory-mapped I/O with the provision of a dedicated I/O space.

26.30 Describe the use of the stack in interrupt handling.

26.31 In what form of memory (ROM or RAM) would it be normal to store the system vectors? Why?

26.32 Why is EEPROM not considered to be a non-volatile RAM?

26.33 What methods of computer input/output would seem most appropriate for the following applications?

(a) Reading pushbuttons in a computer-controlled washing machine.

(b) Interfacing a keyboard to a personal computer.

(c) Connecting a high-speed disk drive to a computer.

26.34 Explain the meaning of the term 'FILO' and give examples of the use of such a structure. Within computers, it is often useful to produce a first-