SECTION A **ANSWER ALL Questions in this section**

QUESTION 1

a) Is machine code a low level or high level programming language?

[1]

b) In 8086 assembler, what do the following instructions do?

i. DB.
ii. DW.

[2]

c) What is the difference between MOV AX,1000H and MOV AX,[1000H]?

[2]

d) Express 31_{10} in

i. Binary [2]
ii. Hexadecimal. [2]

Show all of your workings.

e) Put the following memory types in decreasing order of access speeds: Main system memory, L3 cache, L2 cache, L1 cache, register memory, disk drive. What memory types would you normally expect to find embedded on the CPU silicone chip?

[4]

f) On a normal Hard drive where are the following structures found?

i. Master Boot Record (Partition Table). [2]

ii. Boot Sector (Boot Record). [2]

g) A process moves through a series of discrete process states. What are the three main process states?

[3]

[Total 20]

SECTION B **SELECT ANY TWO Questions from this section**

QUESTION 2

a) AX, BX, CX and DX are 16-bit 80x86 general purpose registers. For each register note what other special functions they have and what is the name of the 8-bit portions of each register.

[8]

b) If the memory location 0345H contains a value of 27H and AL contains 0BCH. What is the result of the following logic operations? **Note:** use the same two values for memory and AL each time:

```
AND   AL,[0345H]
OR    AL,[0345H]
XOR   AL,[0345H]
NOT   AL
```

Show all of your workings. [8]

c) Given that on entry register AX contains 3H and register BX contains 4H, what will be the contents of registers AX, BX and CX after execution of the following program fragment: Show your results by single stepping through the code.

```
        MOV   CX,0
AGAIN:  ADD   CX,AX
        DEC   BX
        JZ    DONE
        JMP   AGAIN
DONE:   MOV   AX,0
        MOV   BX,0
```

If register AX and BX contained 2H and 5H respectively, can you say what registers AX, BX and CX would contain after execution of the above program fragment without doing anymore work? Say why! [9]

[Total 25]

PLEASE TURN OVER

QUESTION 3

a) Draw the truth tables for AND, OR, XOR logic gates.

[6]

b) Draw the circuit for a half adder:
   i. Explain how the circuit functions.
   ii. Write out the truth table for the half adder.

[8]

c) In Boolean logic circuits explain what is meant by the majority rule for multiple inputs?

[3]

d) When referring to microprocessors what do the terms RISC and CISC mean?

[2]

e) What are the 5 steps in a fetch-execute cycle?

[5]

f) What is meant by the term Big Endian?

[1]

[Total 25]

QUESTION 4

a) In most systems memory is divided into two sections. What are they?

[2]

b) What are the advantages and disadvantages of Fixed-partition Memory Allocation?

[4]

c) Briefly describe how Variable-partition Memory Allocation works.

[4]

d) What are the three placement strategies used in Variable-partition memory Allocation?

[3]

e) What is the basic method of Paging?

[2]

f) What is meant by the term Context Switching?

[3]

g) What is a Thread?

[2]

h) What three conditions need to be satisfied when dealing with the Critical-Section Problem?

[3]

i) When using Semaphores, what are the two atomic operations required to when accessing a process?

[2]

[Total 25]