higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

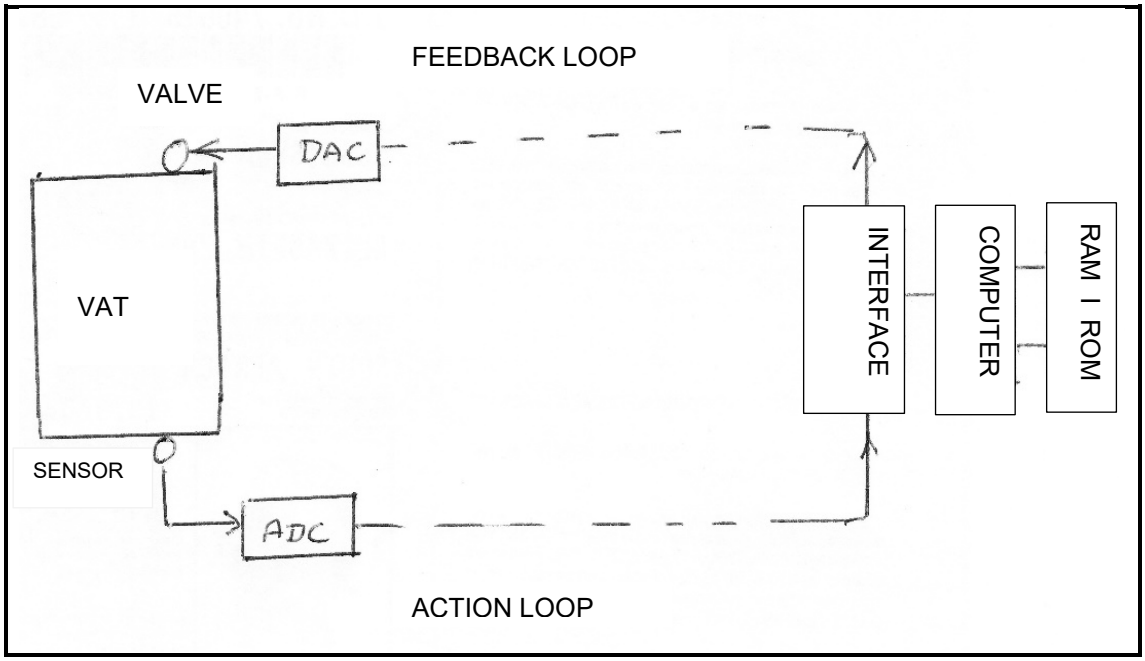
DIGITAL ELECTRONICS N6

27 JULY 2018

This marking guideline consists of 8 pages.

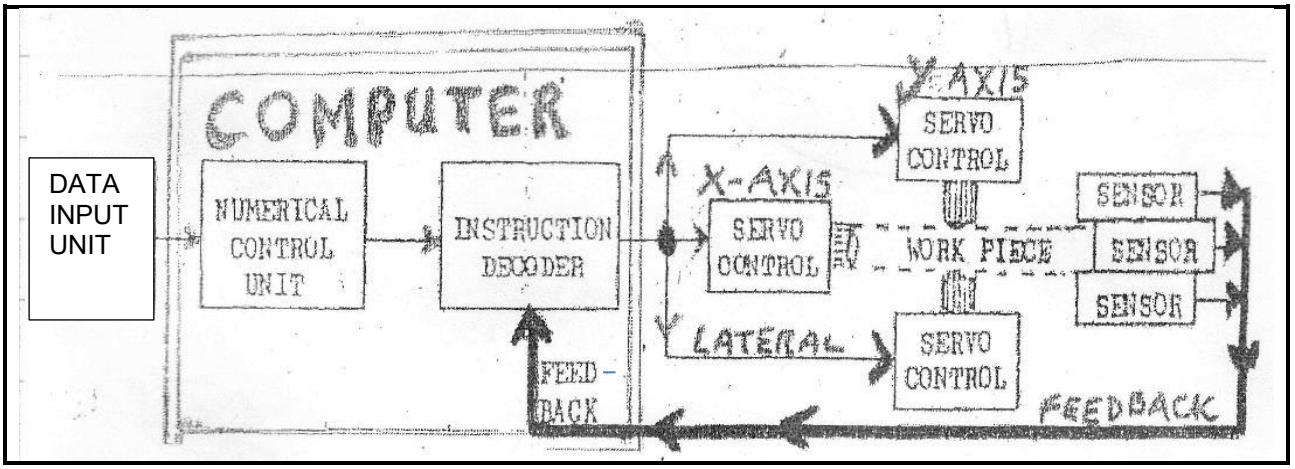
QUESTION 1: COMPUTER SYSTEMS

1.1



NOTE: Because the computer is remote a modem may be included on both sides of the feedback and action loops.
(Any similar but correct drawing may be used.) (12)

1.2

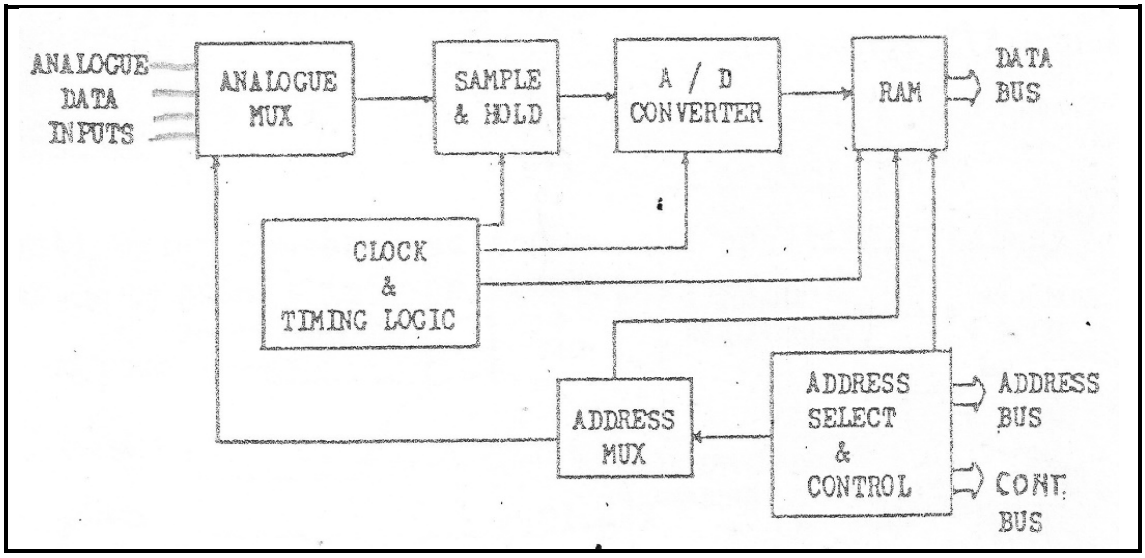


- Set points, data and modifications are entered at the data input unit.
- The cutting tool is moved sequentially and the feedback transmits a signal on completion of an action of which the cutting tool is moved to the next position. (6)

NOTE: Without the feedback loop the diagram is wrong. If the feedback is included, TWO marks should be awarded. (2)
[20]

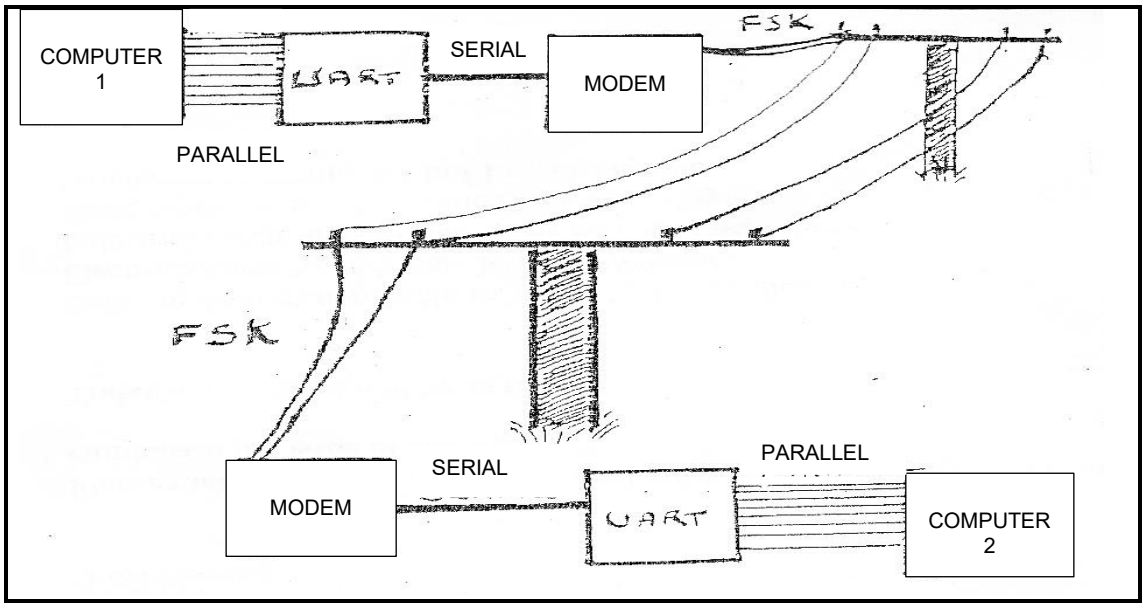
QUESTION 2: TRANSMISSION, DATA ACQUISTION AND RELATED HARDWARE

2.1



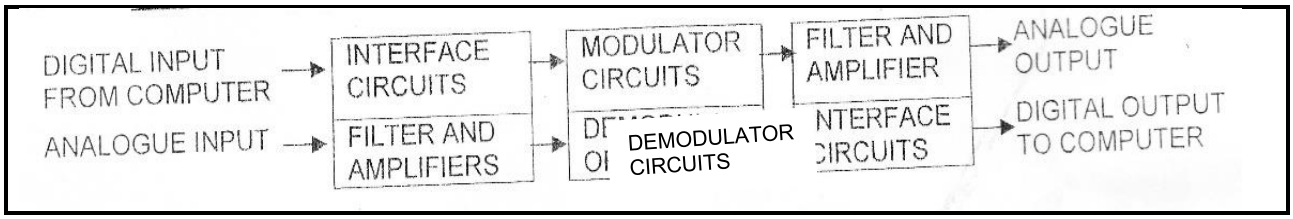
(8)

2.2



NOTE: 1. The telephone lines may be represented by dotted or dashed lines.
2. It must be clearly indicated where the outputs are parallel, serial and in **fsk** format. (6)

2.3

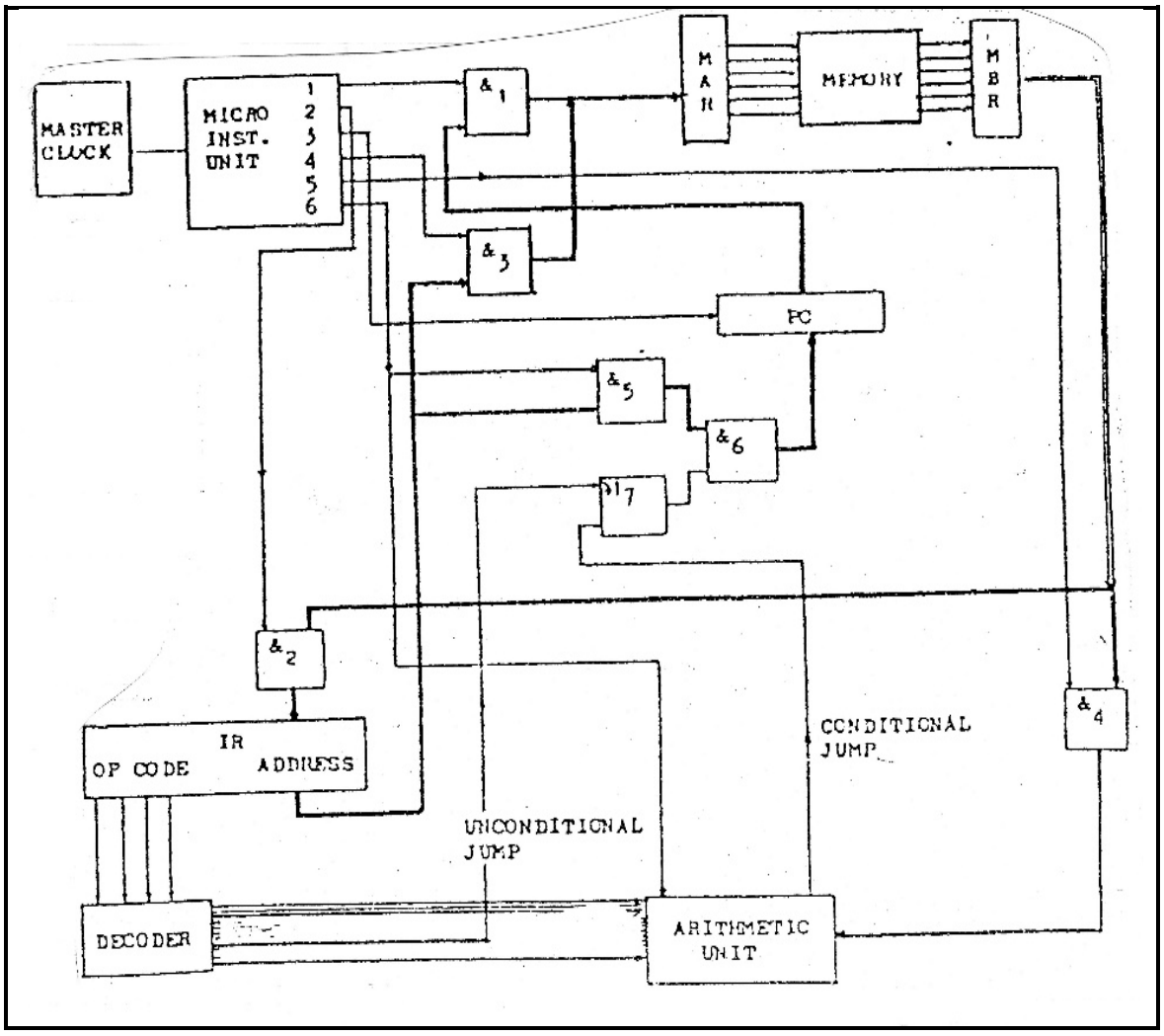


The modem converts digital data from the computer into frequency shifted keying **(fsk)** on the transmit side and **fsk** back into digital data on the receive side.

NOTE: 1. TWO marks for stating the function on the transmit and receive side - NO half marks: it is completely correct or it is wrong (2)
2. FOUR marks for the diagram (4)
[20]

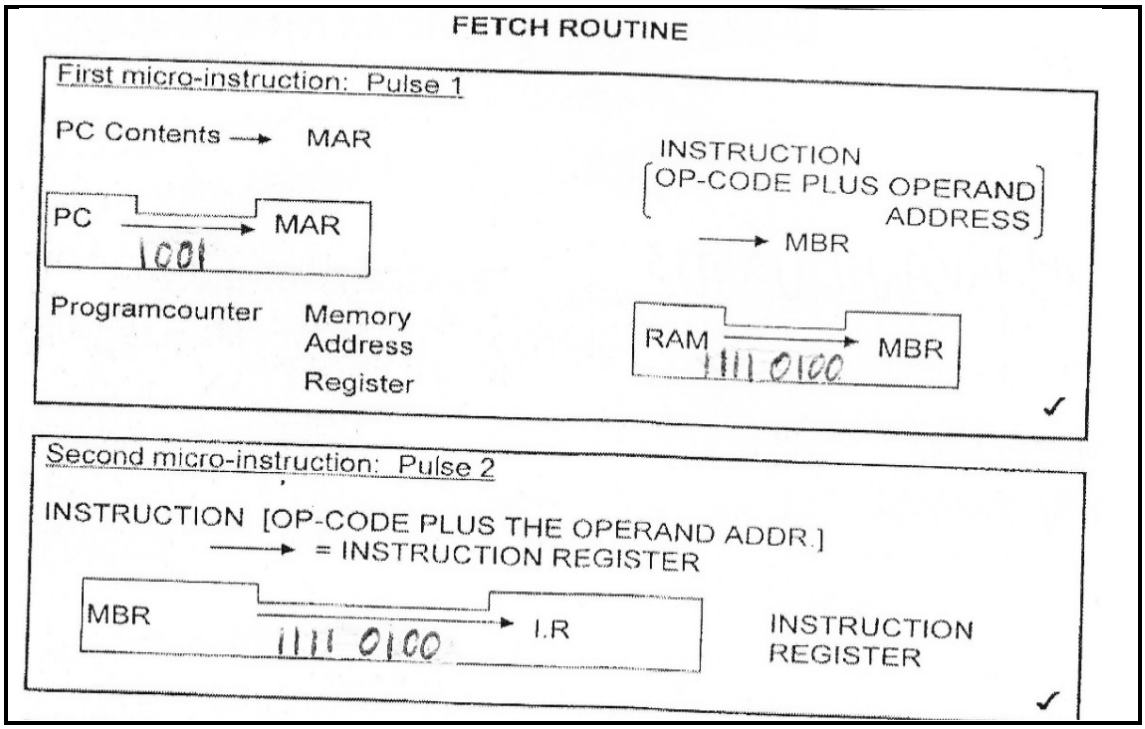
QUESTION 3: COMPUTER ARCHITECTURE

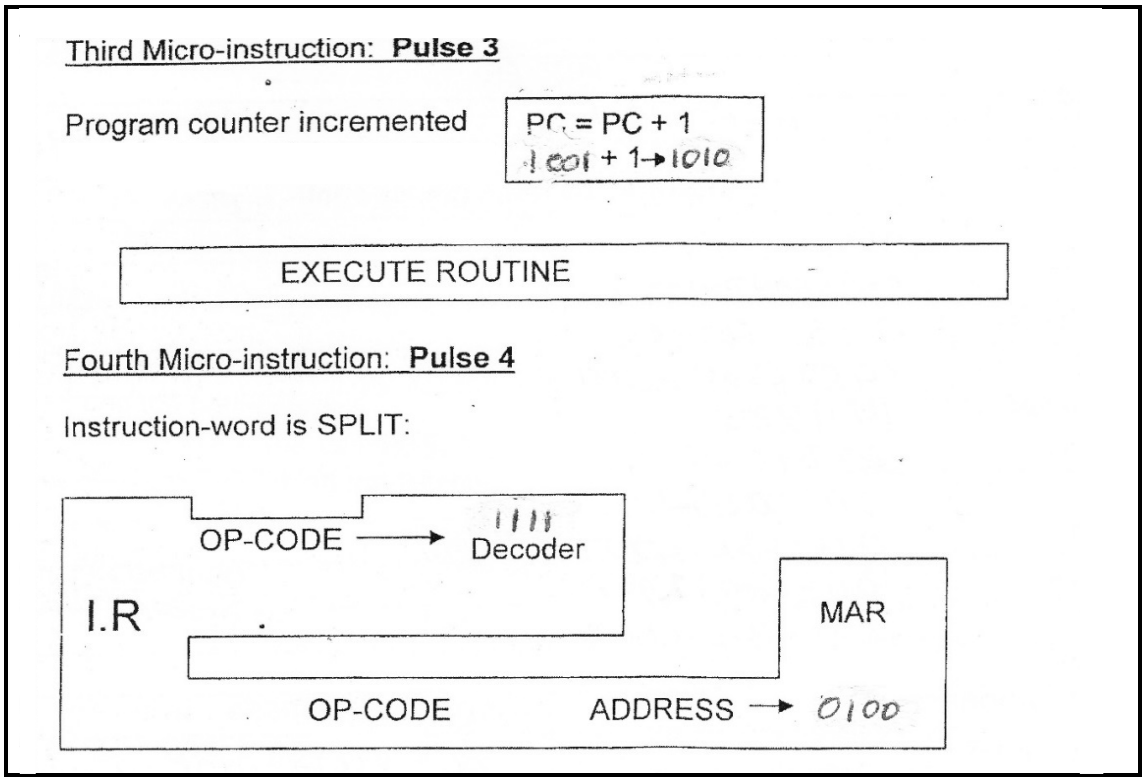
3.1

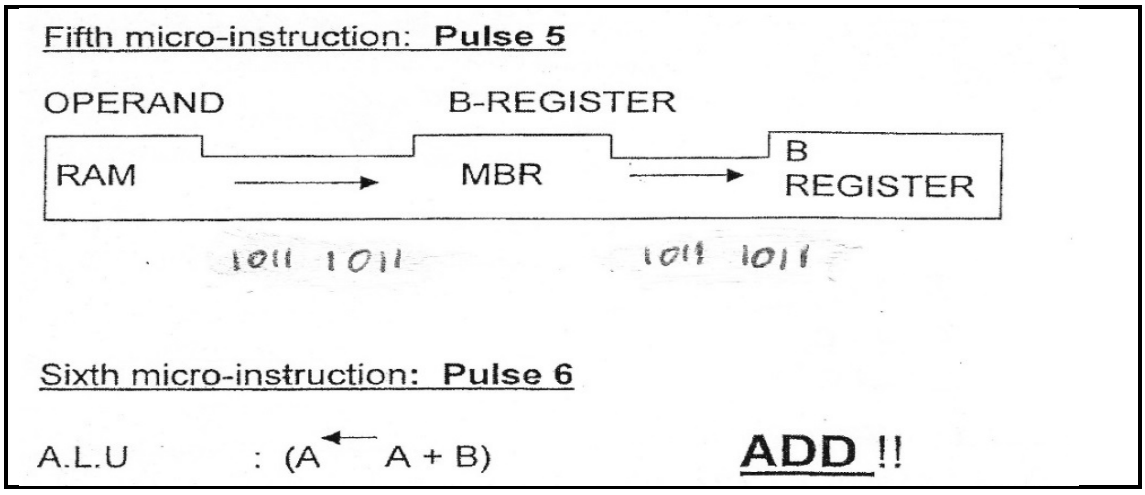


(10)

3.2


FETCH ROUTINE
First micro-instruction: Pulse 1
PC Contents → MAR
INSTRUCTION
OP-CODE PLUS OPERAND ADDRESS
→ MBR
PC → MAR
1001
Programcounter
Memory Address Register
RAM → MBR
1111 0100
Second micro-instruction: Pulse 2
INSTRUCTION [OP-CODE PLUS THE OPERAND ADDR.]
→ = INSTRUCTION REGISTER
MBR → I.R
1111 0100
INSTRUCTION REGISTER


Third Micro-instruction: Pulse 3
Program counter incremented
PC = PC + 1
1001 + 1 → 1010
EXECUTE ROUTINE
Fourth Micro-instruction: Pulse 4
Instruction-word is SPLIT:
OP-CODE → Decoder
1111
I.R
MAR
OP-CODE
ADDRESS → 0100



(10)
[20]

QUESTION 4: HIGH-LEVEL PROGRAMMING

4.1 THE WORDS OF WISDOM FOR TODAY ARE:

BE CHEERFUL STRIVE TO BE HAPPY

NOTE:
1. TWO marks if the top line is there AND 2 spaces are left between the top line and the bottom line (2)
2. EIGHT marks if the candidate could follow the program and not only get the print-out correct but put it in capitals and all in one line (8)

4.2
- The cost of a new system or expansion of the existing system
- Hiring of additional and specialised personnel
- Training of personnel
- Advantages and benefits that can be derived from the proposed system
- Environmental considerations
- Problem areas as well as possible solutions
- Commissioning and installation
- Service and back-up facilities
- Data files and format requirements at both input and output terminals
- Future expansion and estimated lifetime of the system (Any 6 × 1) (6)

4.3
- ATM withdrawals
- Card swipe machines
- Airline/Theatre/Bus reservations
- Gaming (Any relevant answer) (Any ONE) (1)

4.4 Stack Pointer
06

Stack

Address	Contents
03	600_{16}
04	$3A2_{16}$
05	081_{16}
06	$2F0_{16}$

NOTE: 1. ONE mark for incrementing the stack pointer, ONE mark for indicating the new address and 1 mark for including the new contents (3)
2. If the candidate did not redraw the rest of the stack, only the mark for the correct stack pointer can be given.

[20]

QUESTION 5: NUMBER SYSTEMS

5.1 $0_1\ 1_2\ 1_3\ 0_4\ 0_5\ 1_6\ 1_7\ 0_8\ 1_9\ 0_{10}$

Pos. 1 checks 3; 5; 7; 9
1 0 1 1 – P1 should thus be 1: NOT thus: 1

Pos. 2 checks 3; 6; 7; 10
1 1 1 0 – P2 should thus be 1: NOT thus: 1

Pos. 4 checks 5; 6; 7
0 1 1 – P4 should thus be 0: NOT thus: 1

Pos. 8 checks 9; 10
1 0 – P8 should thus be 1: IT IS thus: 0

Thus the fault lies on bit $0111_2 – 7_{10}$

Thus pos.7 which is a 1 should be a 0

i.e. the word should be: **$0110010010_{hamming}$** (10)

5.2 $+0{,}00110000 \times 10^{+010}$

$= 0{,}11_2$

$= 0{,}5 + 0{,}25$

$= 0{,}75_{10}$ (3)

5.3 **$1110\ 1111\ 0000_{2.4.2.1}$**

NOTE: ONE mark for each nibble (4-bit string). If the subscript is omitted, the answer is wrong. (3)

5.4 **1001101_2**

NOTE: ONE mark for the correct conversion and ONE mark for showing the subscript 'gray' (2)

5.5 A + B + C = (A + B) + C = A + (B + C)
A.B.C = (A.B).(C) = A.(B.C)

NOTE: Any variables may be used. (2)
[20]

TOTAL: 100