

# HNDIT 1104 – Data Representation and Organization

## Marking Scheme

### Q1

- i. Compare terms **Data** and **Information** (04 Marks)

*Data :*

- collected raw facts
- Cannot be used for decision making

*Information:*

- Processed data
- Can be used to decision making

- ii. Name four basic data types available in Computer (04 Marks)

*Any four of following*

- Numeric Data
  - Numbers (Integer, real)
- Non-numeric Data
  - Letters, Symbols
- Alphanumeric :
- Image data
- Audio data
- Video data

- iii. Express following units in bits. (04 Marks)

- Nibble
- Word

**Nibble:** It is a combination of 4 bits.

**Word:** It is a combination of 16 bits.

- iv. Positional Number Systems also names as Weighted Number System. Give two examples for it. (04 Marks)

- Positional Number Systems / Weighted Number System
  - Decimal, Octal, Hexadecimal, Binary

v. Write following numbers as sum of product using appropriate weights. (04 Marks)

a.  $245.56_{10}$

b.  $BA0_{16}$

a.  $245.56 = 2 \times 10^2 + 4 \times 10^1 + 5 \times 10^0 + 5 \times 10^{-1} + 6 \times 10^{-2}$

b.  $BA0_{16} = 11 \times 16^2 + 10 \times 16^1 + 0 \times 16^0$

vi. Convert following numbers to given number system

(05 Marks)

a. Convert  $79.5_{10}$  to Binary

b. Convert  $110.1_8$  to Decimal

a. For calculation part 02 marks and answer 0.5 marks:

$1001111.1_2$

b. For calculation part 02 marks and answer 0.5 marks:

$72.125$

## Q2

i. Convert the following numbers into given number system?

(12 Marks)

a.  $(4768)_{10}$  into hexadecimal

**Ans  $12A0_{16}$**

b.  $(F4C)_{16}$  into decimal

**Ans  $(3916)_{10}$**

c.  $(426)_{10}$  into an octal

**Ans  $652_8$**

d.  $362.35_8$  into a decimal

**Ans  $(242.453125)_{10}$**

e.  $0.10111_2$  into an octal

**Ans  $0.56_8$**

f.  $0.100110101_2$  into a hexadecimal

**Ans  $0.9A8_{16}$**

- ii. Convert the following hexadecimal numbers into equivalent octal numbers. (04 Marks)

a.  $A72E_{16}$

**Ans  $(123456)_8$**

b.  $4.BF85_{16}$

**Ans  $(4.577024)_8$**

- iii. Convert the following octal numbers into equivalent hexadecimal numbers. (04 Marks)

a.  $(247)_8$

**Ans  $(A7)_{16}$**

b.  $(36.532)_8$

**Ans  $(1E.AD)_{16}$**

- iv. Convert the following numbers into Binary Numbers (05 Marks)

a.  $79.EA_{16}$

**Ans  $1111001.1110101_2$**

b.  $7A.F8_{16}$

**Ans  $1111010.11111_2$**

c.  $0.56_8$

**Ans  $0.10111_2$**

**(Total 25 Marks)**

### Q3.

- i. Perform following binary adding operations

a.  $01011010 + 00111101$

**Ans:  $10010111$**

b.  $00110011 + 01111110$

**Ans:  $10110001$**

*(04 marks)*

- ii. Perform following binary subtraction operations

a.  $10110110 - 10101001$

**Ans:  $1101$**

b.  $11101101 - 10100101$

**Ans: 1001000**

iii. Perform following binary multiplication operations

a.  $00010110 * 111$

**Ans: 10011010**

b.  $00001101 * 1010$

**Ans: 10000010**

(04 marks)

iv. Perform following binary division operations

a.  $111011 / 11$

**Ans: 10011**

b.  $101010 / 101$

**Ans: 1000**

(04 marks)

v. Convert to Binary and perform the binary operations for the followings

a.  $123_{10} + 47_{10}$

**Ans:  $1111011 + 101111 = 10101010$**

b.  $137_8 + 231_8$

**Ans:  $1011111 + 10011001 = 11111000$**

c.  $CD_{16} - 1F_{16}$

**Ans:  $11001101 + 00011111 = 11101100$**

(09 marks)

Question 04 - Answer guide.

(1)

[ a)  $+37 = 00100101$  [02 marks]

b)  $-37 = 10100101$  [02 marks]

II two values to represent zero as  
+0 and -0 [02 marks]

III

$$\begin{array}{r}
 00010001 \quad (+17) \\
 11110111 \quad (-8) \\
 \hline
 100001000 \\
 \text{Carry } \rightarrow 1+ \\
 \hline
 00001001 \quad (9)
 \end{array}$$

[04 marks]

Verification

$(+17) + (-8) = 9$

$00001001 = 9$

[02 marks]

IV  $6_{10} = 00000110_2$

Complement =  $11111001$

Add 1 to complemented value =  $\begin{array}{r} 11111010 \end{array}$

$-6 = 11111010$

[04 marks]

②

$$\text{Va) } +9 = 00001001$$

$$\text{complemented} = 11110110$$

$$\left. \begin{array}{l} \text{Add 1 to} \\ \text{complemented} \\ \text{value} \end{array} \right\} = \begin{array}{r} \phantom{1111} 1 + \\ 11110111 \\ \hline \end{array}$$

$$-9 = 11110111$$

\_\_\_\_\_ [01 mark]

$$+5 = 00000101$$

\_\_\_\_\_ [01 mark]

$$\begin{array}{r} -9 \longrightarrow 11110111 \\ +5 \longrightarrow 00000101 \\ \hline -4 \longrightarrow \hline \hline \end{array}$$

$$\begin{array}{r} 11111100 \\ \hline \hline \end{array}$$

\_\_\_\_\_ [01 mark]

$$+4 = 00000100$$

$$\text{comple.} = 11111011$$

$$\phantom{11111011} 1 +$$

$$-4 = \begin{array}{r} 11111100 \\ \hline \hline \end{array}$$

\_\_\_\_\_ [01 mark]

b)  $-9 \rightarrow 11110111$   
 $-5 \rightarrow 11111011 +$   


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 $-14$   


---

  
 $111110010$   


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11110010  
 7  
 8<sup>th</sup> bit = 1; Answer is negative  
 discard 9<sup>th</sup> bit.

$$\therefore -14 = 11110010$$

1 1 1 1 0 0 1 0  
↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓  
0 0 0 0 1 1 0 1

00001110  $\rightarrow +14$

[04 marks]

**Q5.**

- i. Express  $9730_{10}$  number in BCD format (08 Marks)

9	7	3	0
1001	0111	0011	0000

- ii. Express word “dro” using ASCII format.(hint ASCII value of **d** is 100) (09 Marks)

	<i>d</i>	<i>r</i>	<i>o</i>
ASCII value	100	114	111
ASCII code	1100100	1110010	1101111

- iii. Display 10.375 using IEEE single-precision binary floating-point format: binary32 (08 Marks)

Consider a real number with an integer and a fraction part such as 10.375

- Conversion of the fractional part**

$$0.375 \times 2 = 0.750$$

$$0.750 \times 2 = 1.500$$

$$0.500 \times 2 = 1.000$$

fraction = 0.000, terminate

$(0.375)_{10}$  can be exactly represented in binary as  $(0.011)_2$

Therefore  $(10.375)_{10} = (10)_{10} + (0.375)_{10} = (1010)_2 + (0.011)_2 = (1010.011)_2$

In normalized form  $(10.375)_{10} = 1.010011_2 \times 2^3$

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- From which we deduce:

- The exponent is 3

(and in the biased form it is therefore  $127+3=130=1000\ 0010$ )

- The fraction is 010011 (looking to the right of the binary point)

- From these we can form the resulting 32 bit IEEE 754 binary32 format representation of 10.375 as:

0-10000010-010011000000000000000000



ANSWERS