CS & IT ENGINEERING

Digital Logic
Number System
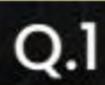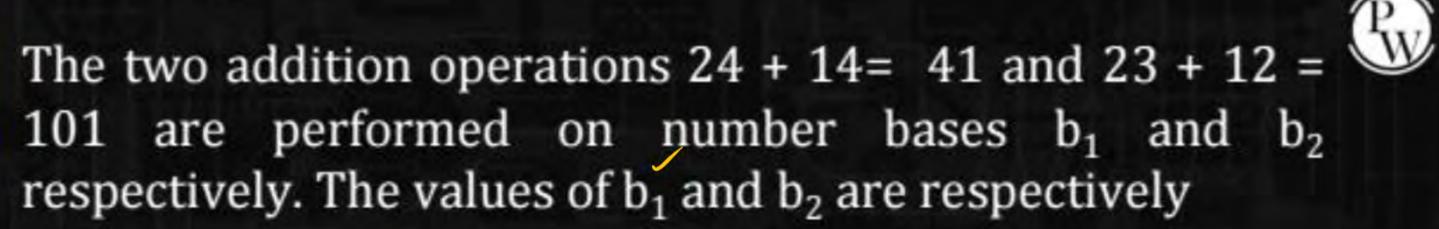
DPP 01 (Discussion Notes)

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Q.1 The two addition operations $24 + 14 = 41$ and $23 + 12 = 101$ are performed on number bases b_1 and b_2 respectively. The values of b_1 and b_2 are respectively

A. 7 and 4

B. 4 and 7

C. 8 and 4

D. 4 and 8
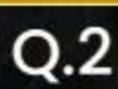
$$(24)_{b_1} + (14)_{b_1} = (41)_{b_1}$$

$$2b_1 + 4 + b_1 + 4 = 4b_1 + 1$$

$$\boxed{b_1 = 7}$$

$$(23)_{b_2} + (12)_{b_2} = (101)_{b_2}$$

$$2b_2 + 3 + b_2 + 2 = b_2^2 + 1$$

$$\boxed{b_2^2 - 3b_2 - 4 = 0}$$

$$b_2 = \frac{3 \pm \sqrt{9 + 16}}{2}$$

$$b_2 = \frac{3 \pm 5}{2} = \boxed{4}$$

Q.2 If x and y are successive numbers in a number system of base b such that $(xy)_b = (25)_{10}$ and $(yx)_b = (31)_{10}$, then

A. $x = 4, y = 5$ and $b = 7$

B. $x = 3, y = 4$ and $b = 6$

C. $x = 4, y = 5$ and $b = 6$

D. $x = 3, y = 4$ and $b = 7$

$$x \times b^1 + y \times b^0 = 25$$

$$\boxed{xb + y = 25}$$

$$3 \times 7 + 4$$
$$21 + 4 = \boxed{25}$$

$$\boxed{yb + x = 31}$$

$$4 \times 7 + 3$$
$$28 + 3$$
$$\boxed{31}$$

Q.3 If $a = (4.4)_5$ and $b = (3.3)_5$, then $a + b = (x)_5$. The subscript 5 denotes the base on which the corresponding number is expressed. The value of x is
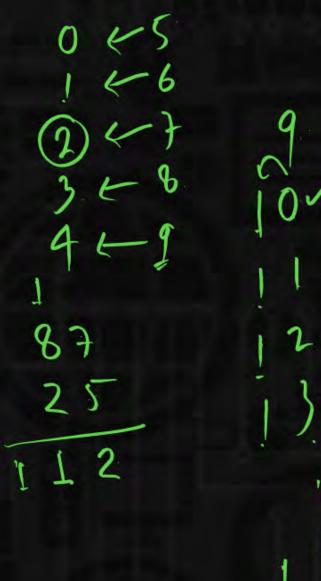
A. 31.2

B. 7.2

C. 8.7

D. 13.2

$$\begin{array}{r} \overset{1}{(4.4)_5} \\ + (3.3)_5 \\ \hline (1\,3\cdot 2)_5 \end{array}$$

$0 \leftarrow 5$
$1 \leftarrow 6$
$②\leftarrow 7$ 9
$3 \leftarrow 8$ $\circlearrowleft$
$4 \leftarrow 9$ $10\checkmark$
1 11
87 12
25 13
$\overline{112}$

$1\,\,\,9$
$\overline{2\,\,\,0}$

Q.4 If $(X1CY)_{16} = (120702)_8$, then X and Y are

A. A and 2

B. B and 1

C. 1 and B

D. 2 and A

001 010 000 111 000 010

$(A1C2)_{16}$

$X1CY$

$X = A \quad Y = 2$

Q.5 Given $(135)_b + (144)_b = (323)_b$ where subscript b denotes the base on which numbers are expressed. What is value of b?

A. 4

B. 5

C. 6 ✓

D. 7

$$(135)_b + (144)_b = (323)_b$$

$$b^2 + 3b + 5 + b^2 + 4b + 4 = 3b^2 + 2b + 3$$

$$b^2 - 5b - 6 = 0$$

$$b = \frac{5 \pm \sqrt{25 + 4 \times 6}}{2}$$

$$b = \frac{5 \pm \sqrt{25 + 16}}{2}$$

$$b = \frac{5 \pm 7}{2}$$

$$\boxed{b = \frac{12}{2} = 6}$$

Q.6 In a digital computer, binary subtraction is performed

A. In the same way as we perform subtraction in decimal number system

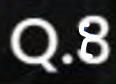B. Using two's complement method $A + (-B)$

C. Using 9's complement method.

D. Using 10's complement

Q. 7 The greatest negative number, which can be stored in a computer that has 8-bit word length and uses 2's complement arithmetic, is

A. -256

B. -255

C. -128

D. -127

$$\text{Range} = -[2^{n-1}] \text{ to } +[2^{n-1}-1]$$

$$= -[2^{8-1}] \text{ to } [2^{8-1}-1]$$

$$= -2^7 \text{ to } \{2^7-1\}$$

$$= -128 \text{ to } +127$$

Q.8 F's complement of $(2BFD)_{hex}$ is

A. E304

B. D403

C. D402

D. C403

$$\begin{array}{r} F\ F\ F\ F \\ -\ 2\ B\ F\ D \\ \hline D\ 4\ 0\ 2 \end{array}$$

15

A = 10
B = 11
C = 12
D = 13
E = 14
F = 15

Q.9 The result of addition operation 34 + 43 performed on minimum base is stored in an 8-bit register. The content of register will be

A. 01000011

B. 00101010

C. 01010101

D. 01010100

$(34)_5 + (43)_5$

$[3 \times 5^1 + 4 \times 5^0] + [4 \times 5^1 + 3 \times 5^0]$

$15 + 4 + 20 + 3$

$19 + 23 = 42$

$\begin{array}{cccccccc} 32 & 16 & 8 & 4 & 2 & 1 \\ 0 & 0 & 1 & 0 & 1 & 0 & 1 & 0 \end{array}$
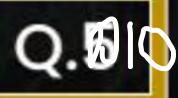
Q.510 Which of the following is equal to $(AB)_{16}$?

A. ✗ $(B7)_{16} - (A)_{16}$

B. $(B5)_{16} - (A)_{16}$

C. $(A0)_{16} + (D)_{16}$

D. $(BA)_{16} + (01)_{16}$

$$1\ 0\ 1\ 1\ \ 1\ 0\ \ 1\ 0\ 1$$
$$-\ 0\ 0\ 0\ 0\ \ 1\ 0\ 1\ 0$$
$$\underbrace{1\ 0\ 1\ 0}_{A}\ \underbrace{1\ 0\ 1\ 1}_{B}$$

$$(AB)_{16}$$

Q.11 An equivalent 2's complement representation of the 2's complement number 1101 is

A. 110100

B. 001101

C. 110111

D. 111101

1101

11101

111101

Q.12 The 2's complement representation of −17 is

A. 101110

B. 101111

C. 111110

D. 110001

$0\ 1\ 0\ 0\ 0\ 1 \longrightarrow +17$

$1\ 0\ 1\ 1\ 1\ 1 \longrightarrow -17$

Q.13 11001, 1001 and 111001 correspond to the 2's complement representation of which one of the following sets of number?

A. 25.9 and 57 respectively

B. −6, −6 and −6 respectively

C. −7, −7 and −7 respectively

D. −25, −9 and −57 respectively

11001 → −7

00111 → +7

1001 → −7
11001 → −7

111001 → −7

111111001 → −7

Q. 14 X = 01110 and Y = 11001 are two 5-bit binary numbers represented in two's complement format The sum of X and Y represented in two's complement format using 6 bits is

A. 100111

B. 001000

C. 000111

D. 101001

$X = 01110 = +14$

$Y = 11001 = -7$

$+7$

000111