Qno. 13, 14, 15, 16 ⇒ do by example.

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Question no. 19

Similar to 18.

| * ⇒ write answer in algorithm.

Question no. 20.

how to convert Binary to Base 64 expansions. — (a)

& 64 exp Base → to Binary. — (b)

& Octal to → 64 base exp. — (c)

& 64 Base exp → octal exp. — (d)

Not Included.

— X —

Qno. 21

Find sum and product.

(a) $(112)_3$, $(210)_3$.

Only Base 2 sum and products are included in our syllabus.

SUM AND PRODUCT:-

ADDITION OF BINARY NO.S:-

Consider following example to understand the method

Add $a = (1110)_2$ and $b = (1011)_2$.

Starting from LSB (Carry ↑, SUM ↑)

$a_0 + b_0 = 0 + 1 = 0.2 + 1$

Take the carry to R.H.S successively.

(previous carry ↑)

$a_1 + b_1 = 1 + 1 + 0 = 1.2 + 0$

and so on.

$+c_1$

$a_2 + b_2 = 1 + 0 + 1 = 1.2 + 0$

$a_3 + b_3 + c_2 = 1 + 1 + 1 = 1.2 + 1$

this carry will be the MSB of the output

∴ starting from c_3 till S1 are the output

$(11001)_2$

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MULTIPLICATION :-

Similary for multiplication consider two binary nos 'a' and 'b' then multiplication is given as :-

$$a.b = a(b_{n-1}2^{n-1} + b_{n-2}2^{n-2} + b_1 2 + b_0 2^0)$$

$$= (ab_{n-1}2^{n-1} + ab_{n-2}2^{n-2} + ab_1 2 + ab_0 2^0)$$

can be re-written as.

$$= ab_0 2^0 + ab_1 2^1 + \cdots ab_{n-2}2^{n-2} + ab_{n-1}2^{n-1}.$$

$$\Rightarrow \sum_{j=0}^{n-1} a.b_j 2^j$$

Now as the no. of power of 2 increases we perform a leftshift as per that no. accordingly ie adding a zero to the right.

$b_j = 0$ $b_j = 1$

0 $a.2^j$

Example :

$a = (110)_2$, $b = (101)_2$

$ab_0 2^0 = (110)_2 (1) 2^0$, $ab_1 2^1 = (110)_2 . 0 . 2^1$

$\Rightarrow (110)_2$ —① $\Rightarrow ((110)0)2^1 \Rightarrow (10000)_2$ —②

$a.b_2 2^2 = (110)_2 . 1 . 2^2$

$110 . 2^2 \Rightarrow (11000)_2$ —③

$ab_3 2^3 \Rightarrow$ doesnot exist

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Now adding ① ② & ③

$(110)_2 + (0000)_2 + (11000)_2$

Adding using the algorithm.

let $a = (110)$

$b = (0000)_2$

$a_0 + b_0 = 0 + 0 = 0.2 + 0$

$a_1 + b_1 = 1 + 0 + 0 = 0.2 + 1$

$a_2 + b_2 = 1 + 0 + 0 = 0.2 + 1$

$\Rightarrow (110)_2$

and

$c = (11000)_2$.

$a_0 + c_0 = 0 + 0 = 0.2 + 0$

$a_1 + c_1 = 1 + 0 = 0.2 + 1 \Rightarrow (11110)_2$ Ans!

$a_2 + c_2 = 1 + 0 = 0.2 + 1$

$a_3 + c_3 = 0 + 1 = 0.2 + 1$

$a_4 + c_4 = 0 + 1 = 0.2 + 1$

Q no. 21 Solve the following for SUM & PRODUCT:-

c. $(10\ 1010\ 1010)_2$ $(1\ 1111\ 0000)_2$

Solve by ourself
→ imp for practice.