

Part : 1

①  $(10111001)_2 \longrightarrow (\quad?)_{10}$

$$\Rightarrow \frac{1 \times 2^0}{+ \frac{1 \times 2^5}{+ 0 \times 2^6}} + 0 \times 2^1 + 0 \times 2^2 + \frac{1 \times 2^3}{+ 1 \times 2^7} + \frac{1 \times 2^4}{+ 0 \times 2^8}$$

$$\Rightarrow 1 + 8 + 16 + 32 + 128$$

$$\Rightarrow (185)_{10}$$

②  $(185)_{10} \rightarrow (?)_2$

185 / 2 = 92	R1 ↑	(10111001) <sub>2</sub>
92 / 2 = 46	R0	
46 / 2 = 23	R0	
23 / 2 = 11	R1	
11 / 2 = 5	R1	
5 / 2 = 2	R1	
2 / 2 = 1	R0	
1 / 2 = 0	R1	

3)

② 4 bits sequences  $\rightarrow$  0000, 0001, 0010, 0011, 0100, 0101, 0111, 0110, 1000, 1001, 1010, 1011, 1100, 1101, 1110, 1111

(b)  $2^n$  ; ex.  $2^1 = 4$  ;  $2^4 = 16$  ;  $2^3 = 8$  ;  $2' = 2$

$$\textcircled{1} \quad \text{total letters} \rightarrow (119 + 52) \times 2 = 342$$

$$2^8 = 256 \quad - \text{ less than } 342$$

$$2^9 = 512 \quad \checkmark$$

we can use 9 bits.

$$\textcircled{4} \quad \text{a) } \underline{\text{red}}: (240)_{10} \rightarrow (?)_{16}$$

$$\begin{array}{rcl} 240 / 16 & = & 15 \quad R \, 0 \\ 15 / 16 & = & 0 \quad R \, 15 \end{array} \quad \uparrow \quad (F0)_{16}$$

$$\underline{\text{green}}: (121)_{10} \rightarrow (?)_{16}$$

$$\begin{array}{rcl} 121 / 16 & = & 7 \quad R \, 9 \\ 7 / 16 & = & 0 \quad R \, 7 \end{array} \quad \uparrow \quad (79)_{16}$$

$$\underline{\text{blue}}: (46)_{10} \rightarrow (?)_{16}$$

$$\begin{array}{rcl} 46 / 16 & = & 2 \quad R \, 14 \\ 2 / 16 & = & 0 \quad R \, 2 \end{array} \quad \uparrow \quad (2E)_{16}$$

$$\boxed{(F0792E)_{16}}$$

$$\begin{array}{ll} \text{b) } F \rightarrow 1111 & 2 \rightarrow 0010 \\ 0 \rightarrow 0000 & E \rightarrow 1110 \\ 7 \rightarrow 0111 & \\ 9 \rightarrow 1001 & \end{array}$$

$$(F0792E)_{16} \rightarrow (1111 \, 0000 \, 0111 \, 1001 \, 0010 \, 1110)_2$$

⑤ a)  $3840 \times 2160 = (8,294,400)$

b)  $109,065,600 = 8,294,400 \times 24$

c)  $24,883,200 = 109,065,600 / 8$

d)  $20 \text{ mins} = (?) \text{ seconds}$

$20 \times 60 = 1200 \text{ seconds}$

total frames =  $1200 \times 75 = 90,000$

total bytes in 4K for 1 image,

$\rightarrow 24,883,200$

total bytes in 20 mins 4K video =  $24,883,200 \times 90,000$

$= 2,239,488,000,000 \text{ bytes.}$

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