PSET 1 Solutions

1.1(a) $4 = 2^2$ → 2 bits

1.1(b) $2^4 = 16$ $2^5 = 32$ → 5 bits

1.2(a) $4^2 = 16$ $4^3 = 64$ → 3 bits

1.2(b) $64 / 20 = 3.2$ → 3 labels

1.3(a) $3 \times 9 = 27$

1.3(b) $\log_{10}(4^{27}) = 16.26$ → 17

1.3(c) $\log_{10}(20^9) = 11.71$ → 12

2.1(a) Oct 16 16:00, 16 → 10000 ∴ 10000 10000

2.1(b) $d_4 \cdot \bar{d}_3 \cdot \bar{d}_2 \cdot \bar{d}_1 \cdot \bar{d}_0 \cdot h_4 \bar{h}_3 \cdot \bar{h}_2 \cdot \bar{h}_1 \cdot \bar{h}_0$

2.1(c) Minterm

2.2(a) 1, 7, 8, 14, 15, 21, 22, 28, 29 → weekend dates

00001, 00111, 01000, 01110, 01111, 10101, 10110, 11100, 11101

$\bar{d}_4\bar{d}_3\bar{d}_2\bar{d}_1 d_0 + \bar{d}_4\bar{d}_3 d_2 d_1 d_0 + \bar{d}_4 d_3 \bar{d}_2 \bar{d}_1 \bar{d}_0 + \bar{d}_4 d_3 d_2 d_1 \bar{d}_0 + \bar{d}_4 d_3 d_2 d_1 d_0 + d_4 \bar{d}_3 d_2 \bar{d}_1 d_0$
$+ d_4\bar{d}_3 d_2 d_1 \bar{d}_0 + d_4 d_3 d_2 \bar{d}_1 \bar{d}_0 + d_4 d_3 d_2 \bar{d}_1 d_0$

2.2(b) Minterm, SOP

2.3(a) day can't be 0, hour can't exceed 23: invalid 11000, 11001, 11010 ...

$$\prod_{d=0}^{31} M(d) \cdot \prod_{d=1}^{31}\left[\prod_{h=24}^{31} M(32d+h)\right]$$

↓ when day is 0

2.3(b) $\overline{(\bar{d}_4\bar{d}_3\bar{d}_2\bar{d}_1\bar{d}_0) + (h_4 \cdot h_3)}$
$= (d_4 + d_3 + d_2 + d_1 + d_0) \cdot (\bar{h}_4 + \bar{h}_3)$

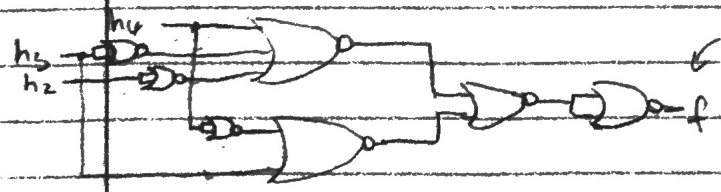
2.3(c) $d_4 d_3 d_2 d_1 d_0 + \bar{h}_4 \cdot \bar{h}_3$

2.4(a) 0~11 am, 12-23 pm 12: 01100_2 23: 10111

$h_4, h_3, h_2 \geq 0, 1, 1$ $h_4 + h_3 \cdot h_2$

2.4(b) h_4, h_3, h_2: 011, 100, 101 ⇒ $\bar{h}_4 h_3 h_2 + h_4 \bar{h}_3 \bar{h}_2 + h_4 \bar{h}_3 h_2$
$= \bar{h}_4 h_3 h_2 + h_4 \bar{h}_3$

2.4(c)



$f = \overline{h_4 + \bar{h}_3 + \bar{h}_2} + \overline{h_4 + h_3}$