

$$\text{vii)} \quad p = (a \vee b) \wedge (c \vee d)$$

a) Clauses are -  $a, b, c, d$

b) Clause a

$$p = (a \vee F) \wedge (T \vee T)$$

$$= a \vee F$$

$$= a$$

$$p_a = \neg b \wedge (c \vee d)$$

Clause b

$$p = (F \vee b) \wedge (T \vee T)$$

$$= F \vee b$$

$$= b$$

$$p_b = \neg a \wedge (c \vee d)$$

Clause c

$$p = (T \vee T) \wedge (c \vee F)$$

$$= c \vee F$$

$$= c$$

$$p_c = (a \vee b) \wedge \neg d$$

Clause d

$$p = (T \vee T) \wedge (F \vee d)$$

$$= F \vee d$$

$$= d$$

$$\therefore (a \vee b) \wedge \neg c$$

$$Pd = (a \vee b) \wedge (c \vee d)$$

c)

	a	b	c	d	$(a \vee b) \wedge (c \vee d)$
1	T	T	T	T	T
2	T	T	T	F	T - c determine predicate
3	T	T	F	T	T - d determine pred
4	T	T	F	F	F - c/d determine pred
5	T	F	T	T	T - a
6	T	F	T	F	T - a/c
7	T	F	F	T	T - a/d
8	T	F	F	F	F - c/d
9	F	T	T	T	T - b
10	F	T	T	F	T - b/c
11	F	T	F	T	T - b/d
12	F	T	F	F	F - c/d
13	F	F	T	T	F - a/b
14	F	F	T	F	F - a/b
15	F	F	F	T	F - a/b
16	F	F	F	F	F

d)

$$a = \{5, 6, 7\} \times \{13, 14, 15\}$$

$$b = \{9, 10, 11\} \times \{13, 14, 15\}$$

$$c = \{2, 6, 10\} \times \{4, 8, 12\}$$

$$d = \{3, 7, 11\} \times \{4, 8, 12\}$$

$$\begin{aligned}
 e) \quad a &= \{5, 6, 7\} \times \{13, 14, 15\} \\
 b &= \{9, 10, 11\} \times \{13, 14, 15\} \\
 c &= \{2, 6, 10\} \times \{4, 8, 12\} \\
 d &= \{3, 7, 11\} \times \{4, 8, 12\}
 \end{aligned}$$

$$\begin{aligned}
 f) \quad a &= \{5, 13\}, \{6, 14\}, \{7, 15\} \\
 b &= \{9, 13\}, \{10, 14\}, \{11, 15\} \\
 c &= \{2, 4\}, \{6, 8\}, \{10, 12\} \\
 d &= \{3, 4\}, \{7, 8\}, \{11, 12\}
 \end{aligned}$$

$$ix) \quad p = a \vee b \vee (c \wedge d)$$

a) clauses are -  $a, b, c, d$

b) clause  $a$

$$\begin{aligned}
 p &= a \vee F \vee (F \wedge F) \\
 &= a \vee F \vee F \\
 &= a
 \end{aligned}$$

$$\begin{aligned}
 p_a &= \neg(b \vee (c \wedge d)) \\
 &= \neg b \wedge (\neg c \vee \neg d)
 \end{aligned}$$

clause  $b$

$$p = F \vee b \vee (F \wedge F)$$

$$1 = F \vee b \vee F$$

$$= b$$

$$p_b = \neg(a \vee (c \wedge d))$$

$$= \neg a \wedge (\neg c \vee \neg d)$$

clause c

$$p = F \vee F \vee (c \wedge T)$$

$$= c \wedge T$$

$$= c$$

$$p_c = \neg(a \vee b \vee d)$$

$$= \neg a \wedge \neg b \wedge \neg d$$

clause d

$$p = F \vee F \vee (T \wedge d)$$

$$= T \wedge d$$

$$= d$$

$$p_d = \neg(a \vee b \vee c)$$

$$= \neg a \wedge \neg b \wedge \neg c$$

c)

	a	b	c	d	$a \vee b \vee (c \wedge d)$	clause determining predicate
1	T	T	T	T	T	
2	T	T	T	F	T	
3	T	T	F	T	T	
4	T	T	F	F	T	
5	T	F	T	T	T	
6	T	F	T	F	T	

6	T	F	T	T	T	a
7	T	F	F	T	T	a
8	T	F	F	F	T	a
9	F	T	T	T	T	
10	F	T	T	F	T	b
11	F	T	F	T	T	b
12	F	T	F	F	T	b
13	F	F	T	T	T	c/d
14	F	F	T	F	F	a/b/d
15	F	F	F	T	F	a/b/c
16	F	F	F	F	F	a/b

d)

$$a = \{6, 7, 8\} \times \{14, 15, 16\}$$

$$b = \{10, 11, 12\} \times \{14, 15, 16\}$$

$$c = \{13\} \times \{15\}$$

$$d = \{13\} \times \{14\}$$

e)

$$a = \{6, 7, 8\} \times \{14, 15, 16\}$$

$$b = \{10, 11, 12\} \times \{14, 15, 16\}$$

$$c = \{13\} \times \{15\}$$

$$d = \{13\} \times \{14\}$$

f)

$$a = \{6, 14\}, \{7, 15\}, \{8, 16\}$$

$$b = \{10, 14\}, \{11, 15\}, \{12, 16\}$$

✓      1   2   3   4   5   6   7   8   9   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24   25   26   27   28   29   30   31   32   33   34   35   36   37   38   39   40   41   42   43   44   45   46   47   48   49   50   51   52   53   54   55   56   57   58   59   60   61   62   63   64   65   66   67   68   69   70   71   72   73   74   75   76   77   78   79   80   81   82   83   84   85   86   87   88   89   90   91   92   93   94   95   96   97   98   99   100

$$C = \{13, 15\}$$

$$d = \{13, 14\}$$