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Experiment No. :- 02 Aim :- To Verify Validity,satisfiability and logical equivalence in propositional calculus.

In [8]:

```
f=propcalc.formula("a&b")
```

In [9]:

```
f.truthtable()
```

Out[9]:

a	b	value
False	False	False
False	True	False
True	False	False
True	True	True

In [12]:

```
g=propcalc.formula("a|b")
```

In [13]:

```
g.truthtable()
```

Out[13]:

a	b	value
False	False	False
False	True	True
True	False	True
True	True	True

In [16]:

```
h=propcalc.formula("p<->q")
```

In [17]:

```
h.truthtable()
```

Out[17]:

p	q	value
False	False	True
False	True	False
True	False	False
True	True	True

In [20]:

```
i=propcalc.formula("p->q")
```

In [21]:

```
i.truthtable()
```

Out[21]:

p	q	value
False	False	True
False	True	True
True	False	False
True	True	True

Q1.i

In [23]:

```
m1=propcalc.formula("(p&q)&~(p|q)")
```

In [24]:

```
m1.truthtable()
```

Out[24]:

p	q	value
False	False	False
False	True	False
True	False	False
True	True	False

In [35]:

```
m1.is_tautology()
```

Out[35]:

False

In [36]:

```
m1.is_contradiction()
```

Out[36]:

True

In [37]:

```
m1.is_satisfiable()
```

Out[37]:

False

Q1.ii

In [38]:

```
m2=proptcalc.formula("(p->q)<->(~p|q)")
```

In [39]:

```
m2.truthtable()
```

Out[39]:

p	q	value
False	False	True
False	True	True
True	False	True
True	True	True

In [40]:

```
m2.is_tautology()
```

Out[40]:

True

In [41]:

```
m2.is_contradiction()
```

Out[41]:

False

In [42]:

```
m2.is_satisfiable()
```

Out[42]:

True

Q1.iii

In [43]:

```
m3=proptcalc.formula("(a|b)<->((~a&c)->(b&c))")
```

In [44]:

```
m3.truthtable()
```

Out[44]:

a	b	c	value
False	False	False	False
False	False	True	True
False	True	False	True
False	True	True	True
True	False	False	True
True	False	True	True
True	True	False	True
True	True	True	True

In [45]:

```
m3.is_tautology()
```

Out[45]:

False

In [46]:

```
m3.is_contradiction()
```

Out[46]:

False

In [47]:

```
m3.is_satisfiable()
```

Out[47]:

True

Q1.iv

In [49]:

```
m4=propcalc.formula("(p|q)&(~p)&(~q)")
```

In [50]:

```
m4.truthtable()
```

Out[50]:

p	q	value
False	False	False
False	True	False
True	False	False
True	True	False

In [51]:

```
m4.is_tautology()
```

Out[51]:

False

In [52]:

```
m4.is_contradiction()
```

Out[52]:

True

In [53]:

```
m4.is_satisfiable()
```

Out[53]:

False

Q2.i

In [54]:

```
m5=propcalc.formula("~(p&q) ")
```

In [57]:

```
m6=propcalc.formula("~p|~q")
```

In [58]:

```
m5==m6
```

Out[58]:

True

Q3.

In [60]:

```
x=propcalc.formula("( (p->(~q))&(r->q)&r)->(~p) ")
```

In [61]:

```
x.truthtable()
```

Out[61]:

p	q	r	value
False	False	False	True
False	False	True	True
False	True	False	True
False	True	True	True
True	False	False	True
True	False	True	True
True	True	False	True
True	True	True	True

In [62]:

```
x.is_tautology()
```

Out[62]:

True

As the x is valid

conclusion:-The validity ,satisfiability and logical equivalence is verified in propositional calculus.

In []: