4. **Consider S and T as variables and the following relation representing the relationships:**

**(i) a: ¬(SVT)**
**(ii) b: (S&T)**
**(iii) c: TV¬T**
**(iv) d: ¬(S->S)**
**(v) e: ¬S ¬T**

**Analyze the following for PL-TT entailment and show whether**
**(i). 'a' entails 'b',**
**(ii). 'a' entails 'c',**
**(iii). 'a' entails 'd' and**
**(iv). 'a' entails 'e'**

**Program:**

➔when s=True, t=True

```
s=True
t=True
a = not(s or t)
print(a)
b = s and t
print(b)
c = t or(not t)
print(c)
d = not((not s or s) and (not s or s))
print(d)
e = not(not s) and (not t)
print(e)

if a==b:
    print("a entails b")
if a==c:
    print("a entails c")
if a==d:
    print("a entails d")
if a==e:
    print("a entails e")
else:
    print("no entailment")
```

**Output:**

```
False
True
True
False
False
a entails d
a entails e
>>>
```

➔ when s=True, t=False:

```
s=True
t=False
a = not(s or t)
print(a)
b = s and t
print(b)
c = t or(not t)
print(c)
d = not((not s or s) and (not s or s))
print(d)
e = not(not s) and (not t)
print(e)

if a==b:
    print("a entails b")
if a==c:
    print("a entails c")
if a==d:
    print("a entails d")
if a==e:
    print("a entails e")
else:
    print("no entailment")
```

**Output:**

```
False
False
True
False
True
a entails b
a entails d
no entailment
```

➔ when s=False, t=True

```
s=False
t=True
a = not(s or t)
print(a)
b = s and t
print(b)
c = t or(not t)
print(c)
d = not((not s or s) and (not s or s))
print(d)
e = not(not s) and (not t)
print(e)

if a==b:
    print("a entails b")
if a==c:
    print("a entails c")
if a==d:
    print("a entails d")
if a==e:
    print("a entails e")
else:
    print("no entailment")
```

**Output:**

```
False
False
True
False
False
a entails b
a entails d
a entails e
```

➔ when s=False, t=False

```
s=False
t=False
a = not(s or t)
print(a)
b = s and t
print(b)
c = t or(not t)
print(c)
d = not((not s or s) and (not s or s))
print(d)
e = not(not s) and (not t)
print(e)

if a==b:
    print("a entails b")
if a==c:
    print("a entails c")
if a==d:
    print("a entails d")
if a==e:
    print("a entails e")
else:
    print("no entailment")
```

**Output:**

```
True
False
True
False
False
a entails c
no entailment
```