Q1:

Entropy for result

r Result $< \begin{cases} 6F \\ 2P \end{cases}$

$\Rightarrow$ Entropy $= -[6/8 \, \log 6/8 + 2/8 \log 2/8]$

$= 0.811$

Entropy end sem | Result

$\begin{array}{cc} 4T & 4N \\ 3F \; 1P & 3F \; 1P \end{array}$

$T \Rightarrow -[3/4 \log 3/4 + 1/4 \log 1/4] = 0.811$

$N \Rightarrow -[\quad] = 0.811$

$\Rightarrow$ weighted ent $= 0.811$

$\Rightarrow$ Info gain $= 0$.

Entropy for programming | Result

$\begin{array}{cc} 4T & 4N \\ 2P \; 2F & 6P \; 4F \end{array}$ $\qquad Y = -2/4 \log (2/4) + 2(4 \log (2/4)) = 1$

$N = 0$.

of $\qquad$ weighted entropy $= 0.5$

Info gain $= 0.311$

Entropy (paper reading) Result

$\begin{array}{cc} 4T & 4N \\ 2P \; 2F & 6P \; 4F \end{array}$ $\qquad Y = [2/4 \log (2/4) + 2/4 \log (2/4)] = 1$,

$N = 0.0$.

weighted entropy $= 0.5$

Info gain $= 0.311$

paper reading $\cdot \swarrow \begin{matrix} Tes \\ No \end{matrix} < $ Program $\cdots < \begin{matrix} Yes \; (pass) \\ No \; (fail) \end{matrix}$.
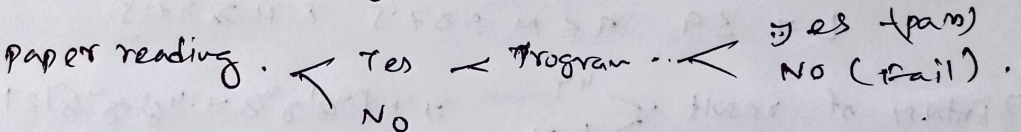
Q2)

Entropy calc for result

Result $\begin{cases} 2 \, pass \\ 6 \, fail \end{cases}$

$E_R = -[P_{fa} \cdot \log fail + P_{pass} \log P_{pass}]$

$= -6/8 \log 6/8 + 2/8 \log 2/8 \cdot = 0.811$

Paper reading.

No $\rightarrow$ 0 $\qquad$ Ten $= 1$.

weighted ent $= 0.5 -$ Info gain $= 0.311$

programming .1 exam result

$$satis = 1\,1/2\log 1/2 + 1/2\log 1/2 \, 7 = 1$$

$$Notsatis = 1\overline{} \quad 0 \rightarrow 0) = 0.$$

weighted $= 0.5$ $\Rightarrow$ Info $= 0.3$ "

Endsem --- = .Abv A

Abv average = $.3/4\log 3/4 + 1/4\log(1/4) = 0.81$"

below ,, "L' ,, ,, = 0.81 "

weighted = 0.81" $\Rightarrow$ Info gain 0.

So, final tree:

paper reading
```
           .1
    ┌───────────────────┐
   yes                  no.
    ↓                    ↓
 prog. assign.          fail
    ↓
 ┌──────────────┐
satisfactory   not satisfactory
  ↓                 ↓
 pass              fail
```
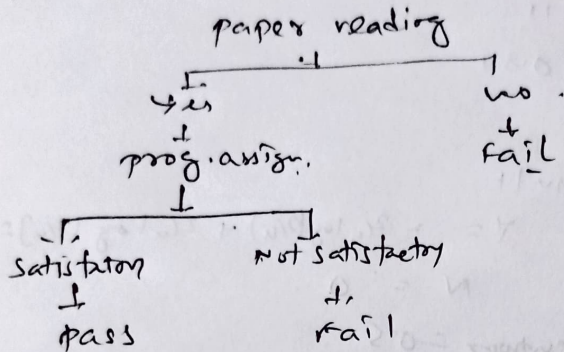
a3)

Temp $\Rightarrow$ 2, 5, 13, 17, 30, 45, 130, 300.

N N 9 9 9 9 N N.

mean $= \frac{5+13}{2} = 9$ Mean $\frac{45+130}{2} = 80.5$

$\Rightarrow$ Temp divide into 3 classes:

L $\Rightarrow$ ≤9   9 ≤ M ≤ 87.5   & H ≥ 87.5

$\Rightarrow$ Entropy of result $\cdot < \begin{smallmatrix} 4 4 \\ 4 N. \end{smallmatrix}$ $\Rightarrow -[4/8\log 4/8 + 4/8\log 4/8] = 1$

$\Rightarrow$ Entropy of size l sustain $\cdot < \begin{smallmatrix} 4 4 \\ 4 3 \end{smallmatrix} < \begin{smallmatrix} 2N \\ 2Y \\ 2N \end{smallmatrix}$

$\Rightarrow$ B $= -[2/4\log 2/4 + 2/4\log 2/4] = 1$

$\Rightarrow$ S $= -[2/4\log 2/4 + 2/4\log 2/4] = 1$

$\Rightarrow$ weighted entropy $= 1$

$\Rightarrow$ Info gain $= 0$.

⇒ Entropy of orbit | sustain.

⇒ $F = \cdot 3/5 \log 3/5 + 3/5 \log 2/5 = 0.97$

⇒ $N = 0.92$

weighted entropy = 0.95

Info gain = 0.05

⇒ Entropy of Temp | sustain.

⇒ $L = -\frac{1}{1} \log 1 + 0 \log 0 = 0$ | weighted = 0
Info gain = 1

⇒ $M = 0$ ⇒ $H = 0$

Hence:

        Temp.

     L   M   H
    No   Yes   No
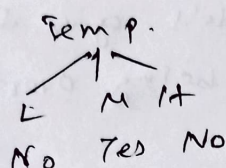
(b) · Humidity divide → 3 class.
        $L \leq 45,\ 45 \leq M \leq 65,\ H > 65$

⇒ Entropy · Humidity | sustain.
   ⇒ $L = 0$; $M = 0.92$ ·⇒ $H = 0$.
       weighted entropy = 0.345
       · Info gain = 0.655

⇒ for humidity → max info. gain

⇒ Entropy of size | sustain, Humid.
   ⇒ $S = [-1 \log 1 + 0 \log 0] = 0$ | weighted = 0
   ⇒ $B = 0$

⇒ Entropy orbit | sust.
   $N = 0$, $Y = 1$.   · weighted entropy = 0.67

⇒ Entropy · of sustain | Humidity.
   ⇒ · $-[2/3 \log 2/3 + 1/3 \log 1/3] = 0.92$

Information Gain:

$I_{sunshine} = 0.92$ $I_{orbit} = 0.25$

Max I_n for Size

```
                  Humidity
                 /    |    \
               L      M      H
              No     Size    yes
                     /  \
                    S    B
                   No   Yes
```
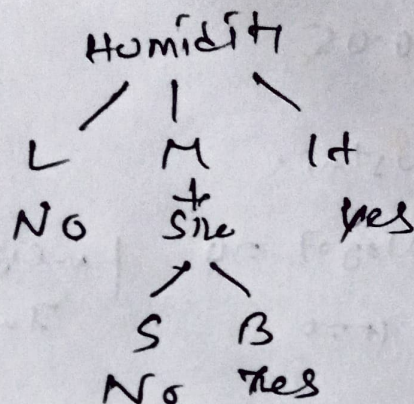
As we can observe both models give different ans w:
This is due to our models being overfitted.