**Input Data required:**

I) Pressure in psia

II) Temperature in Rankine

III) Molecular Weight of Plus fraction

IV) Specific Gravity of Plus fraction

V) Composition of Plus fraction

**Plus fraction properties calculations**

where,

a-f = constant for each property given in the table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 𝞱 | 𝚊 | b | c | d | e | f |
|  | 544.4 | 0.2998 | 1.0555 | -0.00013478 | -0.61641 | 0.0 |
|  | 45203 | -0.8063 | 1.6015 | -0.0018078 | -0.3084 | 0.0 |
|  | 0.01206 | 0.20378 | -1.3036 | -0.002657 | 0.5287 | 0.0026012 |
|  | 6.77857 | 0.401673 | -1.58262 | 0.00377409 | 2.984036 | -0.00425288 |

**1) First find initial equilibrium ration for the iteration. That can be fund by Wilson’s correlation.**

Here, pressure is in atmospheric unit. And temperature in Kelvin unit.

**2) Find composition in vapor phase. is iterated by Newton Raphson method. Initial value of can be best estimated by following equations.**

**3) Iteration for using Newton Raphson method**

**4) Calculation of Equilibrium Ratio using Peng Robinson Equation of State:**

1. for
2. for

🡪 Cubic equation to calculate compressibility factor of liquid and vapor phase.

For liquid phase,

Where,

()

After putting all the above three constant values in the cubic equation we will get three roots. Among all the three roots smallest root will be

For gas phase,

After putting all the above constants for vapor phase, we will get three roots of cubic equation. Among all the three roots largest root is .

**🡪 Fugacity calculations:**

I) Liquid Fugacity:

II) Vapor Fugacity:

Where,

Here,

For solution following condition should be satisfied

**5) Density Calculation:**

where,

ρ = density of liquid or gas phase (

P = system pressure, psi

R = universal gas constant, 10.73 ( )

T = system temperature, °R

Z = compressibility factor

= apparent molecular weight of liquid or vapor

* Apparent molecular weight in liquid phase

Here is molecular weight of component i