1)

3)

Events = {No symptoms, took decode, took nuhi, Symptoms, covid +ve )

Already given, P(No symptoms) = 1 – P(symptoms) = 1 – 0.1 = 0.9

P(took decode | no symptoms ) = 0.95

P(took nuhi | no symptoms ) = 0.05

P(took decode | symptoms ) = 0.80

P(took nuhi | symptoms ) = 0.20

From the given data as of May 1, 2020

No of people who took NUHI = 18058

No of people who took Decode = 31,036

No of people who took Nuhi and tested covid +ve = 1624

No of people who took Decode and tested covid +ve = 174

P( covid +ve | nuhi ) = 1624 / 18058

P( covid +ve | decode ) = 174 / 31,036

P( took decode ) = 0.6322

P( took nuhi ) = 0.3678

P(covid +ve ) = 0.0366

we are considering only those people who are tested and we are considering a person with no symptoms to test with either decode or nuhi.

**P(Covid +ve | no symptoms):**

P( covid +ve | No symptoms) = ( P ( No symptoms | Covid +ve ) \* P(Covid +ve) ) / P ( No symptoms) – (1)

Simplifying (1) using Naïve bayes strategy

P(covid +ve ) = p( people taking decode test and tested covid +ve ) \* p ( choosing decode test ) + P (people taking nuhi and tested covid+ve) P( choosing nuhi test) – (2)

P( No symptoms | Covid positive ) = P( No symptoms and took decode | Covid +ve ) + P( No symptoms and took NUHI | covid +ve)

(Considering a person having no symptoms and a person taking decode test are independent events,)

= P ( No symptoms | Took Decode) \* P( Took Decode |Covid +ve) + P ( No symptoms | ~ took decode) \* P(~ took decode |Covid +ve)

= ( P ( Took Decode | No symptoms) \* P(Took Decode) / P (No symptoms) ) \* P( Took Decode |Covid +ve) + P ( No symptoms | ~ took decode) \* P(~ took decode |Covid +ve)

= ( P ( Took Decode | No symptoms) \* P(Took Decode) / P (No symptoms) ) \* P( Took Decode |Covid +ve) + ( P ( ~ took decode | No symptoms) \* P(~ took decode) / P (No symptoms) ) \* P(~ took decode |Covid +ve)

P( No symptoms | Covid positive ) = ( P ( Took Decode | No symptoms) \* P(Took Decode) / P (No symptoms) ) \* P( Took Decode |Covid +ve) + ( P ( ~ took decode | No symptoms) \* P(~ took decode) / P (No symptoms) ) \* P(~ took decode |Covid +ve) -- (3)

P ( Took decode | covid +ve ) = P ( covid +ve | took decode ) \* P(took decode) / P( covid +ve)

= 174 / 31,036 \* 0.6322 / 0.0366 = 0.096

P ( ~Took decode | covid +ve ) = P ( covid +ve | ~took decode ) \* P(~took decode) / P( covid +ve)

= 1624 / 18058\* 0.3678 / 0.0366 = 0.903

Calculating (3)

P( No symptoms | Covid positive ) = ( 0.95 \* 0.6322 / 0.9 ) \* 0.09 + ( 0.05 \* 0.3678 / 0.9) \* 0.903

= 0.0078

Calculating (1)

P( covid +ve | No symptoms) = ( P ( No symptoms | Covid +ve ) \* P(Covid +ve) ) / P ( No symptoms) – (1)

Simplifying (1) using Naïve bayes strategy

= 0.0078 \* 0.0366 / 0.9

= 0.0003

P( No symptoms | Covid positive ) = 0.0078

**P(Covid +ve | Do not have symptoms, decode = 1, NUHI = 0)**

P(Covid +ve | Do not have symptoms, decode = 1, NUHI = 0) =

P(Covid +ve | No symptoms, took decode , ~took nuhi) = P ( No symptoms, took decode, ~took nuhi | covid +ve) \* P ( covid +ve) / P ( No symptoms, took decode, ~took nuhi) – (4)

P ( No symptoms, took decode, ~took nuhi) = P(No symptoms) \* P( Took Decode) \* P( ~Took Nuhi ) –(5)

P ( No symptoms, took decode, ~took nuhi | covid +ve) = P( No symptoms | covid +ve) \* P( took decode | covid +ve ) \* P( ~took nuhi | covid +ve)

= 0.000072

Substituting the above value and

P(Covid +ve | No symptoms, took decode , ~took nuhi) = 0.07