

# Probability and Random Processes

Snehil Singh EE22BTECH11050\*

## Question :

Out of 1000 individuals in a town, 100 unidentified individuals are covid positive. Due to lack of adequate covid-testing kits, the health authorities of the town devised a strategy to identify these covid-positive individuals. The strategy is to:

- 1) Collect saliva samples from all 1000 individuals and randomly group them into sets of 5.
- 2) Mix the samples within each set and test the mixed sample for covid.
- 3) If the test done in (ii) gives a negative result, then declare all the 5 individuals to be covid negative.
- 4) If the test done in (ii) gives a positive result, then all the 5 individuals are separately tested for covid.

Given this strategy, no more than testing kits will be required to identify all the 100 covid positive individuals irrespective of how they are grouped

- 1) 700
- 2) 600
- 3) 800
- 4) 1000

## Solution :

We would need to initially test each group of 5 individuals together and, if any group tests positive, test all 5 individuals separately to identify the COVID-positive individual(s) within that group.

$$\text{Number of groups} = \frac{1000}{5} \quad (1)$$

$$= 200 \quad (2)$$

Number of tests required initially to test all groups = 200

As out of the 1000 individuals, there are 100 COVID-positive individuals.

## Worst case Scenario

There will be 100 groups of 5 individuals

who will test positive. Now, for these 100 groups: We would need to test the 5 individuals in that group separately.

$$\text{Number of tests in each positive group} = 5 \quad (3)$$

$$(4)$$

$$\text{Number of more tests} = 5 * 100 \quad (5)$$

$$= 500 \quad (6)$$

$$\text{Total number of tests} = 200 + 500 \quad (7)$$

$$= 700 \quad (8)$$

Therefore, in the worst-case scenario, we would need a total of 200 (initial group tests) + 500 (individual tests) = 700 testing kits to identify all 100 COVID-positive individuals.

**So, the correct answer is option A 700.**