Q 1. C = cycle of size 8 in a complete graph

Then what are all new configurations?

Q 2: How do you find energy of a configuration given to you.

Q3. Suppose $y = e^{\frac{\Delta E}{T}} = 0.3$

and x = random(0,1)

If $(y > x)$: Print ("True")

Else: Print ("False")

1000 times.

③ $(e^{\frac{\Delta E}{T}} > random(0,1))$

here the formula of acceptance probability is designed in such a way that, as the number of iterations/epochs increase, the Probability of accepting the bad performance comes down. as a result fewer changes are accepted.

for input $y = 0.3$

iterations = 1000

case① Total true statements = 293

false statement = 707

$y = 0.9$

Iterations = 1000

True = 893

False = 107

case②

From the above if Random number > Acceptance probability:

reject (Case 1)

else:

Accept (case 2)

The impact of randomness by this process helps simulated annealing to not get stuck at local optimum in search of global optimum.

① The first step is to choose a neighbouring node from initial node. There are N-1 possible chances for the next node to select after the starting node. here adjacent node are neighbour node in the graph.

we now have N-2 possibilities after the second node and so on

Total possibilities = $(n-1) * (n-2) * \ldots * 1 = (n-1)! \Rightarrow (8-1)! = 7!$
This applies to directed graphs however for undirected graphs clockwise and anticlock wise are same so divided by 2.

All possible new configurations are $\frac{7!}{2}$

② The most important step in applying the simulated annealing is definition of the energy or cost function.
The two components of our energy function are
1) The first prevents the nodes from getting too close to each other
2) second deals with the borderlines of the drawing space/graph

Here the first component is the sum over all pairs of nodes of a function that is inversely proportional to the distance between the nodes.

i.e For each pair of nodes i, j, the term is added to energy function

$$a_{ij} = \frac{\lambda_1}{d_{ij}^2}$$

where d_{ij} is the euclidean distance between i and J. and λ_1 is normalising factor that defines the relative importance of this criteria compared to others.