

Ans to the Q. NO. 1.

For part 1 the path planning algorithm I should use is bug based.

In bug based path planning Robots know their location, where they exist in the map. And, they know which direction they will go. They have local knowledge of the environment & global goal. In the They have sensors to detect obstacles. When they find obstacle they start moving sideways. Until they reach the goal they move towards the goal using this stimulation.

In our given scenario in (part 1)  
a forest the robot can  
detect obstacles using sensors  
and it has its initial location  
& the goal.

So, we know that the robot  
is following the bug based path  
planning Algorithm.

## Ans to the Q. No, 2

To map the forest's environment occupancy grid has been taken into account. The mapping Algorithm has been described step by step below  $\Rightarrow$

### ▣ Initializing Grid

$\Rightarrow$  First, an occupancy grid needs to be created by dividing the environment into regular cells.

$\Rightarrow$  All the cells will be initially set to unknown.

### ▣ $\Rightarrow$ Update the grid

$\Rightarrow$  As the robot roams around the ~~forest~~ - <sup>forest</sup> it will update the occupancy grid from sensor data.

$\Rightarrow$  At first it will mark its current positions as empty.

$\Rightarrow$  If sensor data reads an obstacle it will mark the grid as occupied, else empty.

$\Rightarrow$  If it can't reach through any given cell it would be ~~marked as~~ stay unknown.

↳ Pick a Next move:

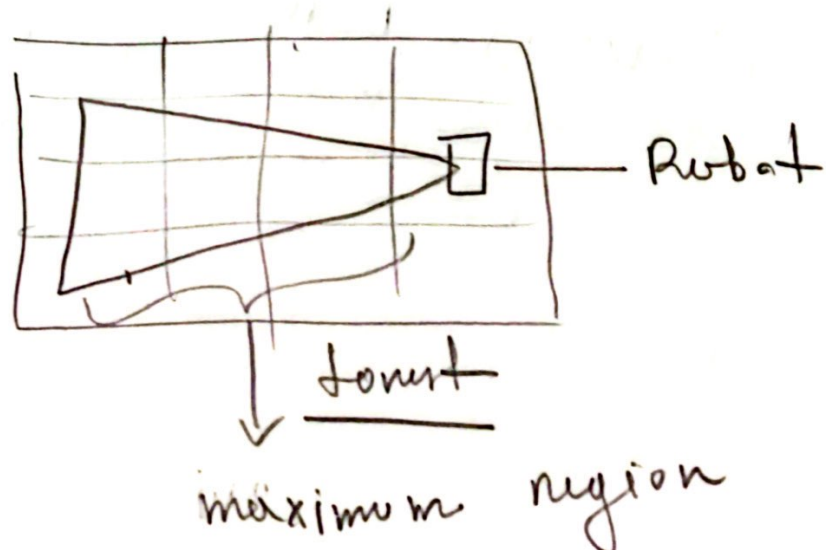
⇒ The robot then shift to a neighbouring position.

⇒ To reach there it can use path planning algorithms like  $A^*$ , shortest path algorithm etc.

⇒ After that it will update its current position & again recompute data after sensing.

↳ loop forever:

⇒ Now this Robot will keep repeating the steps 2nd & third as long as it hasn't explored the whole forest. & has all the locations. ~~when~~ on it has reached its goal.





Ans to the Q. No. 3

For part 2 the localization that has been used is dead-reckoning (motion).

Dead reckoning is a localization method where the robot finds its current position using previous position with the help of where it is moving.

The robot has sensors to calculate where it is going, the direction & how much it is moving. It will use that data & store. When it keeps reaching somewhere it will calculate how much it has moved & in which direction.

In our given scenario, the GPS doesn't work very well. &

I relies on its wheel to know the movements & the motion thus are maintaining to figure out

where they are. So based on these  
So, based on these speculations  
we can say that the robot is  
using dead reckoning localization  
technique.

Ans to the Q. No. 9

When there are no known land-  
marks present in the ~~env~~ environ-  
ment the localization method tech-  
nique that is used is.

Dead - Reckoning. ~~Q~~ Q

This technique uses sensors &  
a Robot's motion to calculate the  
position - But ~~if the~~ the Robot  
Now this method has some  
problems. If the sensor's data  
is not completely accurate or

If the motion is not precise  
the calculation for position ~~to~~ would  
be way off.

To remove this limitation where  
we can use state estimation  
method. With this the  
filter uses probability to  
match with the actual result  
& provide more accurate result