1. Graph Showing the testing and test accuracy as the maximum depth increases:

Graph for training accuracy and Testing Accuracy
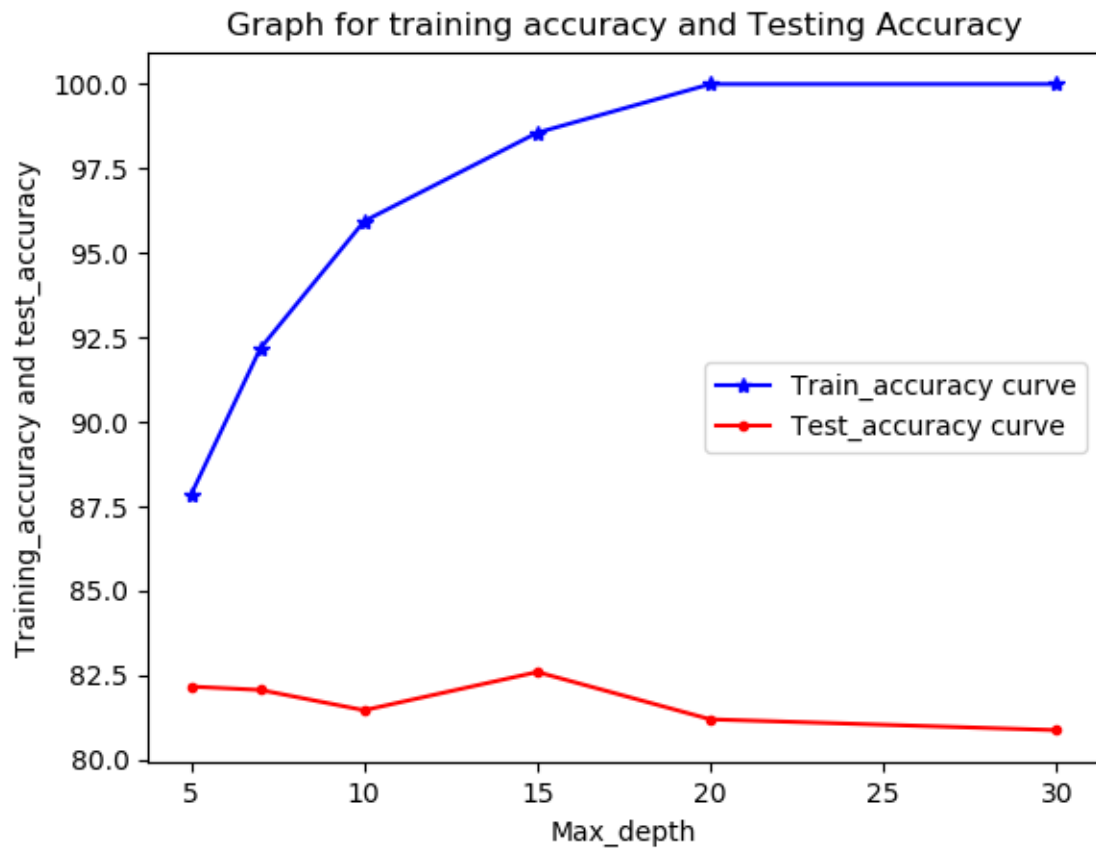
2. Yes, overfitting occur. From, the above graph we can see after 'max_depth=15' training accuracy increasing and test accuracy decreasing. So, we can conclude, for this data set after max depth 15 the overfitting occurs.
3. Word features:
   In my decision tree algorithm for part 2, word feature 'writes' selected as root node.

```
InfoGain Of root node ========  -0.7784609850314237
And the selected root node::    writes
```

Then the depth=1 nodes at writes=0 side are:
     God, that, bible, atheist, keith, murder, laughter, liar, for, name, hope no etc.

```
Current node of the tree:::::::::: writes
writes = 0
Current node of the tree:::::::::: god
   | god  =  0
Current node of the tree:::::::::: that
   | that  =  0
Current node of the tree:::::::::: bible
   | bible  =  0
Current node of the tree:::::::::: atheist
   | atheist  =  0
Current node of the tree:::::::::: keith
   | keith  =  0
```

Depth=1 nodes at writes=1 side are:
  Graphics, image, that, god, keith, who, have, am, time etc.

```
writes = 1
 Current node of the tree:::::::::: graphics
    | graphics  =  0
 Current node of the tree:::::::::: image
    | image  =  0
 Current node of the tree:::::::::: that
    | that  =  0
 Current node of the tree:::::::::: god
    | god  =  0
 Current node of the tree:::::::::: keith
    | keith  =  0
 Current node of the tree:::::::::: who
    | who  =  0
 Current node of the tree:::::::::: have
    | have  =  0
 Current node of the tree:::::::::: am
    | am  =  0
 Current node of the tree:::::::::: time
    | time  =  0
 Current node of the tree:::::::::: by
    | by  =  0
 Current node of the tree:::::::::: with
```

All the words feature not required for decision tree building. Because after depth=15 the
overfitting occurred. So, increasing word features lead to overfitting.

4. Test and Train accuracy on part-2 data using scikit learn model:

Test accuracy: 81.188%

Train Accuracy: 100%

```
Test accuracy Score using Sklearn=== 81.1881188118812 %
Train accuracy Score using Sklearn=== 100.0 %
```