

**Question 1 – 15 marks**

A production system maintains a set of rules about the characteristics of fruits as follows:

- |          |      |  |
|----------|------|--|
| Rule 1:  | IF   | Shape = long AND<br>Colour = green OR yellow                           |
|          | THEN | Fruit = banana   |
| Rule 2:  | IF   | Shape = round OR oblong AND<br>Diameter > 4 inches                     |
|          | THEN | Fruitclass = vine  |
| Rule 3:  | IF   | Shape = round AND<br>Diameter < 4 inches                               |
|          | THEN | Fruitclass = tree  |
| Rule 4:  | IF   | Seedcount = 1  |
|          | THEN | Seedclass = stonefruit   |
| Rule 5:  | IF   | Seedcount > 1  |
|          | THEN | Seedclass = multiple   |
| Rule 6:  | IF   | Fruitclass = vine AND<br>Colour = green                                |
|          | THEN | Fruit = watermelon   |
| Rule 7:  | IF   | Fruitclass = vine AND<br>Surface = smooth AND<br>Colour = yellow       |
|          | THEN | Fruit = honeydew   |
| Rule 8:  | IF   | Fruitclass = vine AND<br>Surface = rough AND<br>Colour = tan           |
|          | THEN | Fruit = cantaloupe   |
| Rule 9:  | IF   | Fruitclass = tree AND<br>Colour = orange AND<br>Seedclass = stonefruit |
|          | THEN | Fruit = apricot  |
| Rule 10: | IF   | Fruitclass = tree AND<br>Colour = orange AND<br>Seedclass = multiple   |
|          | THEN | Fruit = orange   |
| Rule 11: | IF   | Fruitclass = tree AND<br>Colour = red AND<br>Seedclass = stonefruit    |
|          | THEN | Fruit = cherry   |

Rule 12: IF Fruitclass = tree AND  
 Colour = orange AND  
 Seedclass = stonefruit  
 THEN Fruit = peach

Rule 13: IF Fruitclass = tree AND  
 Colour = red OR yellow OR green AND  
 Seedclass = multiple  
 THEN Fruit = apple

Rule 14: IF Fruitclass = tree AND  
 Colour = purple AND  
 Seedclass = stonefruit  
 THEN Fruit = plum

- i) Use **FORWARD CHAINING** to describe the production system table including its working memory, conflict set and rule fired to establish a fruit. Initial data given is :

Shape = round  
 Diameter > 4 inches  
 Surface = smooth  
 Colour = yellow

Terminate when the final value for Fruit in the working memory. [6 marks]

Iteration #	Working memory	Conflict set	Rule fired
0	Shape = round	2,3	Halt
1	Diameter>4 inches	2	2
2	Fruitclass = vine	6,7,8	Halt
3	Surface = smooth	7	Halt
4	Color = yellow	7	7
5	Fruit = honeydew		Halt

- ii) Given the fruit to search is **apple**, use **BACKWARD CHAINING** to describe the production system table including its working memory, conflict set and rule fired to establish the initial data for this fruit.

State the initial facts required to establish that the fruit searched is an apple. [9 marks]

Iteration #	Working memory	Conflict set	Rule fired
0	Fruit = apple Seedclass = multiple Colour = red OR yellow OR green Fruitclass = tree Seedcount > 1 Diameter < 4 inches Shape = round	13 11,13 9,10,11,12,13,14 5 3 2,3	Halt 13 Halt Halt 5 3 Halt

The initial facts required to establish fruit to search is apple are:

Shape = round  
 Diameter < 4 inches  
 Seedcount > 1  
 Colour = Red or Yellow or Green