

# Rule-Based Systems– Solution

1) The knowledge base for a production system is given below:

- If  $\text{Horse}(X)$  and  $\text{Offspring}(Y,X)$  then  $\text{Horse}(Y)$ .
- If  $\text{Parent}(X,Y)$  then  $\text{Offspring}(Y,X)$ .
- If  $\text{Offspring}(X,Y)$  then  $\text{Parent}(Y,X)$ .
- $\text{Horse}(\text{Bluebeard})$ .
- $\text{Parent}(\text{Bluebeard}, \text{Charlie})$ .

Use backward chaining to show that  $\text{Horse}(\text{Charlie})$  is true.

**Answer:**

- **?-Horse(Charlie).** ?- is used to denote a query that we want to satisfy.
- **?-Horse(X) and ?-Offspring(Charlie, X).** We use the first rule, since it is the only rule that matches  $\text{Horse}(\text{Charlie})$ . We might have needed to branch if there were more rules that matched  $\text{Horse}(\text{Charlie})$ .
- **?-Horse(Bluebeard) and ?-Offspring(Charlie, Bluebeard).** Both the first rule and  $\text{Horse}(\text{Bluebeard})$  matches  $\text{Horse}(X)$ . We take a guess that  $X = \text{Bluebeard}$  and try to prove it. If it does not work, we need to backtrack to this point and try the former option.
- **?-Horse(Bluebeard) and ?-Parent(Bluebeard, Charlie).** Only the second rule matches  $\text{Offspring}(\text{Charlie}, \text{Bluebeard})$ .
- **Horse(Charlie) = true.** Since we have reached facts that are in the working memory.