1. Discuss about Constraints Satisfaction Problem (CSP). Solve the following Crypt-arithmetic problem.

a)
```
  FORTY
    TEN
+   TEN
-------
  SIXTY
```

b)
```
  LOGIC
+ LOGIC
-------
 PROLOG
```

c)
```
  WRONG
+ WRONG
-------
 R I GHT
```

2. "All married employees earning Rs. 300,000 or more per year in Nepal pay taxes. All unmarried employees earning Rs. 250,000 or more per year in Nepal pay taxes. The president of Nepal earns Rs. 2,500,000 and has to pay maximum taxes. No other employee earns more than the president. Some of Nepalese citizens earn less that Rs. 100 per day and they don't have to pay any taxes". Represent the above sentences in first-order logic and explain each step.

3. Assume the following facts:
   - ❖ John likes all kinds of food.
   - ❖ Apples are food.
   - ❖ Chicken is food.
   - ❖ Anything anyone eats and isn't killed by is food.
   - ❖ Bill eats peanuts and is still alive.
   - ❖ Sue eats everything bill eats.

   Prove that John likes peanuts using resolution refutation.

4. Assume the following facts:
   - Steve only likes easy courses
   - Science courses are hard
   - All the courses in the basket weaving department are easy
   - BK301 is a basket weaving course

   Use resolution to answer the question, "What course would Steve like?"

5. What are the steps to obtain conjunctive normal form (CNF)? Why CNF is necessary? Transform each of the following sentences into CNF.
   a. $\tilde{}(P \& Q) \& (P \vee Q) \rightarrow R$
   b. $\tilde{}(P \vee \tilde{}Q) \& (R \rightarrow S)$
   c. $P \rightarrow ((Q \& R) \leftrightarrow S)$

6. Differentiate between inference and reasoning. Why probabilistic reasoning is important in the AI? Explain with suitable example

7. At a certain university, 4% of men are over 6 feet tall and 1% of women are over 6 feet tall. The total student population is divided in the ratio 3:2 in favour of women. If a student is selected at random from among all those over six feet tall, what is the probability that the student is a woman?

8. In a County, 51% of the adults are males and the other 49% are females. One adult is randomly selected for a survey involving credit card usage.
   i. Find the prior probability that the selected person is a male.
   ii. It is later learned that the selected survey subject was smoking a cigar. Also, 9.5% of males smoke cigars, whereas 1.7% of females smoke cigars (based on data from the Substance Abuse and Mental Health Services Administration).

Use this additional information to find the probability that the selected subject is a male.

9. How best attribute is selected in a decision-tree? Select the root attribute of the decision-tree from given sample data.

Outlook	Temperature	Humidity	Windy	Play golf (Target variable)
Rainy	Hot	High	False	No
Rainy	Hot	High	True	No
Overcast	Hot	High	False	Yes
Sunny	Mild	High	False	Yes
Sunny	Cool	Normal	False	Yes
Sunny	Cool	Normal	True	No
Overcast	Cool	Normal	True	Yes
Rainy	Mild	High	False	No
Rainy	Cool	Normal	False	Yes
Sunny	Mild	Normal	False	Yes
Rainy	Mild	Normal	True	Yes
Overcast	Mild	High	True	Yes
Overcast	Hot	Normal	False	Yes
Sunny	Mild	High	True	No

10. In Orange County, 51% of the adults are males. (It doesn't take too much advanced mathematics to deduce that the other 49% are females.) One adult is randomly selected for a survey involving credit card usage.
    a. Find the prior probability that the selected person is a male.
    b. It is later learned that the selected survey subject was smoking a cigar. Also, 9.5% of males smoke cigars, whereas 1.7% of females smoke cigars (based on data from the Substance Abuse and Mental Health Services Administration). Use this additional information to find the probability that the selected subject is a male.

11. Determine how many samples (in percentage) should be of type (C = true, S = true, R = false, W = true) using direct sampling method from given belief network.