5. (a) Using the Venn diagram decision procedure, determine if the following are valid or invalid syllogisms:

All hawks are birds
Some birds are brown

$\therefore$ Some hawks are not brown [2]

All hawks are birds
Some birds are brown

$\therefore$ Some hawks are brown [2]

All cars are vehicles
No house is a car

$\therefore$ No house is a vehicle [2]

(b) In the context of rule-based systems, describe the processes of forward and backward chaining. Use examples to illustrate how these processes work. [3]

(c) Anna's cricket team, Coventry, is going to play her friend Bill's team, Durham. Bill offers Anna a friendly bet: whoever's team loses will buy the dinner next time they meet up. They never spend more than £30 on dinner. Had there been no bet, they would share the cost of dinner equally. When deciding whether to accept this bet, Anna will have to assess her team's chances of winning (which will vary according to the weather on the day). She estimates the probability of her team winning when the Weather is wet to be 0.75 and the probability of her team winning if the weather is dry to be 0.2. The prior probability of it raining is 0.2.

i. Create a decision tree for the problem. [4]

ii. Solve the decision tree. [5]

iii. Represent the problem using an influence diagram. [3]

iv. Extend the influence diagram to show how you would incorporate the availability of a weather forecast. What additional information will be required to solve the new influence diagram? [4]