the space provided. No doubts allowed.

1. The probability of a child being a boy is 0.6 and a girl 0.4 (let us suppose). Consider all the families with exactly two children. What is the probability that such a family has two girls given that it has at least one girl? (20 marks)

20

$P(\text{child=Boy}) = 0.6$

$P(\text{child=Girl}) = 0.4$

$P(\text{Boy, Girl}) = 0.24$

$P(\text{Boy, Boy}) = 0.36$

$P(\text{Girl, Girl}) = 0.16$

$P(\text{Girl, Boy}) = 0.24$

$$P(GG \mid \text{atleast 1 Girl}) = \frac{P(GG \cap \text{atleast 1 girl})}{P(\text{atleast 1 girl})}$$

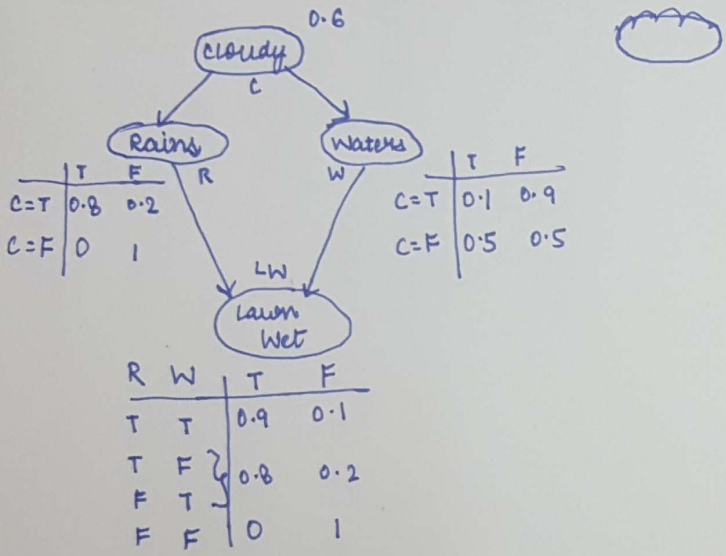
$$= \frac{P(GG)}{P(GG) + P(GB) + P(BG)}$$

$$= \frac{0.16}{0.24 + 0.24 + 0.16} = \frac{0.16}{0.64} = \frac{1}{4} = 0.25$$

2. Santa Singh notes the following. It is cloudy at IIT 60% of the time. Whenever it is ... it rains only 80% of the time. It ...

2. Santa Singh notes the following. It is cloudy at IIT 60% of the time. Whenever it is cloudy, it rains only 80% of the time. It never rains when it is not cloudy. IIT gardeners water the lawn only 10% of the time when it is cloudy, but 50% of the time when it is not cloudy. The lawn is wet 90% of the time whenever it both rains and gardeners water, but only 80% of the time when it only rains or is only watered (but not both). Lawn is never wet if it neither rains nor it is watered. Formulate this as a Bayesian network and help Santa compute the overall probability that the main building lawns is wet. (40 marks)

40



Now, if we denote Lawn Wet by LW, then we need to find $P(LW=T)$

So, $P(LW=T) = \sum_{R,W} P(LW=T, R, W)$

$= \sum_{R,W} P(LW=T/RW) * P_M(R,W)$

Where $P(R,W) = \sum_{C} P(R,W,C)$

$= \sum P(R/C) * P(W/C) * P(C)$

So, $P(R_T, W_T) = P(R_T/C_T) * P(W_T/C_T) * P(C_T) + P(R_T/C_F) * P(W_T/C_F) * P(C_F)$

$= 0.8 * 0.1 * 0.6 + 0$

$= 0.048$

$P(R_T, W_F) = 0.8 * 0.9 * 0.6 + 0$

$= 0.432$

$P(R_F, W_T) = 0.2 * 0.1 * 0.6 + 1 * 0.5 * 0.4$

$= 0.012 + 0.20$

$= 0.212$

$P(R_F, W_F) = 0.2 * 0.9 * 0.6 + 1 * 0.5 * 0.4$

$= 0.108 + 0.20$

$= 0.308$

Now,

$P(LW=T) = P(LW_T/R_T W_T) * P_M(R_T W_T) + P(LW_T/R_F W_T) * P_M(R_F W_T) + P(LW_T/R_T W_F) * P_M(R_T W_F) + P(LW_T/R_F W_F) * P_M(R_F W_F)$

$= [0.9 * 0.048] + [0.8 * (0.212 + 0.432)] + [0]$

$= 0.0432 + 0.5152$

$P(LW=T) = 0.5584$

So the prob that lawn is wet is 0.5584

Roll No:

3. CSE department wants 5 courses to be taught by 3 profs (GS, PB and SB). Each course has 3 slots every week of 1 hour each on Mon, Wed and Friday. Course names and starting times are ToC (8am), DBMS (8.30am), AI (9am), NW (9am), PL (10.30am). SB can teach ToC, AI, PL. PB can teach DBMS, NW, PL. GS can teach ToC, AI, NW. Formulate this as a Constraint Solving Problem. Use one variable for each course and draw the constraint graph showing the domains and constraints. Solve this problem systematically and find all feasible assignments. (40 marks)