TASK 1

PART A

(A) Prior Probability Maine = 0.05

Prior Probability Sahara = 0.95

Let T be the temperature recorded below 8°.

$P(T/M) = 0.8$ $(1-0.2)$

$P(T/S) = 0.1$ Low Temperature in Sahara

$$P(M/T) = \frac{P(M) \cdot P(T/M)}{P(M) \cdot P(T/M) + P(S) \cdot P(T/S)}$$

$$= \frac{0.05 \times 0.08}{(0.05 \times 0.8 + 0.95 \times 0.1)}$$

$$= \frac{0.04}{0.04 + 0.095}$$

$$P(M/T) = 0.2963$$

PART B

Probability in Maine = 29.63 %.

Probability in Sahara = 70.37 %.

$$P(\text{Low}) = 0.29 \times 0.8 + 0.7037 \times 0.1$$
$$= 0.232 + 0.0703$$
$$= 0.3023$$

PART C

$$P(\text{low}) = 0.3023 \times 0.8 + 0.7037 \times 0.1$$
$$= 0.2414 + 0.07037$$
$$= 0.31177$$

TASK 2

PART A

Distribution table

Variable A has 5 values

$B_1 \ldots B_{10}$ have 7 each

So, $(7 * 10 * 5) + 5 = 355$ Values.

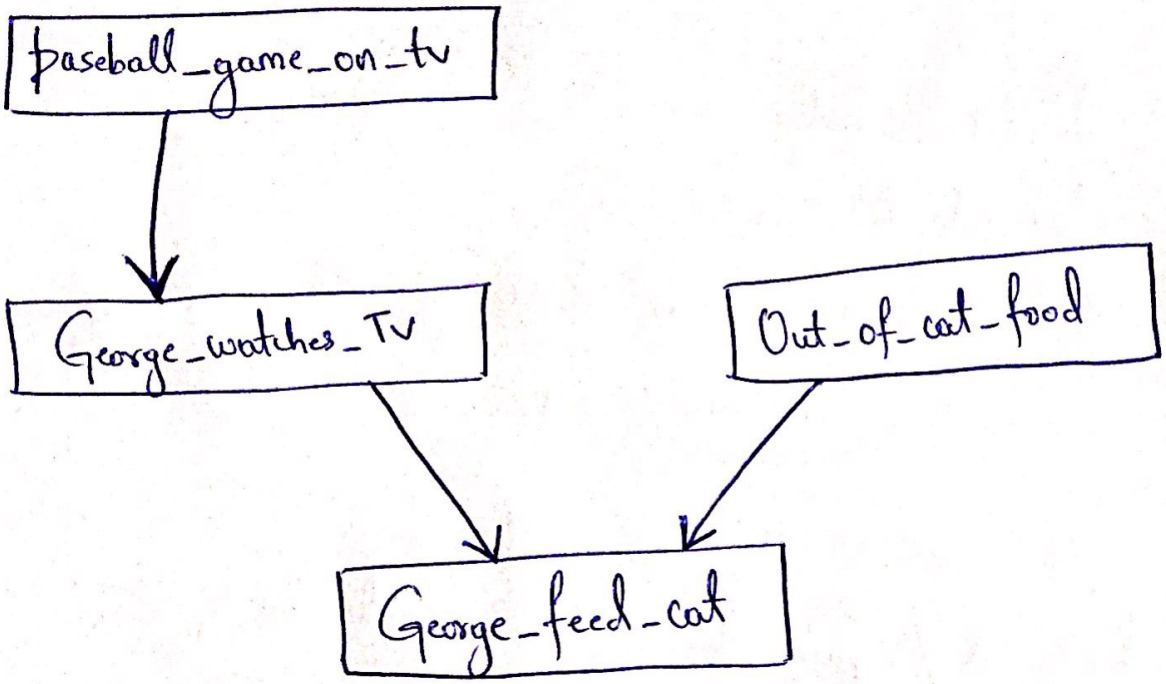
PART B

Reduced / Space Efficient way would be

$= (6 * 10 * 5) + (5 - 1)$

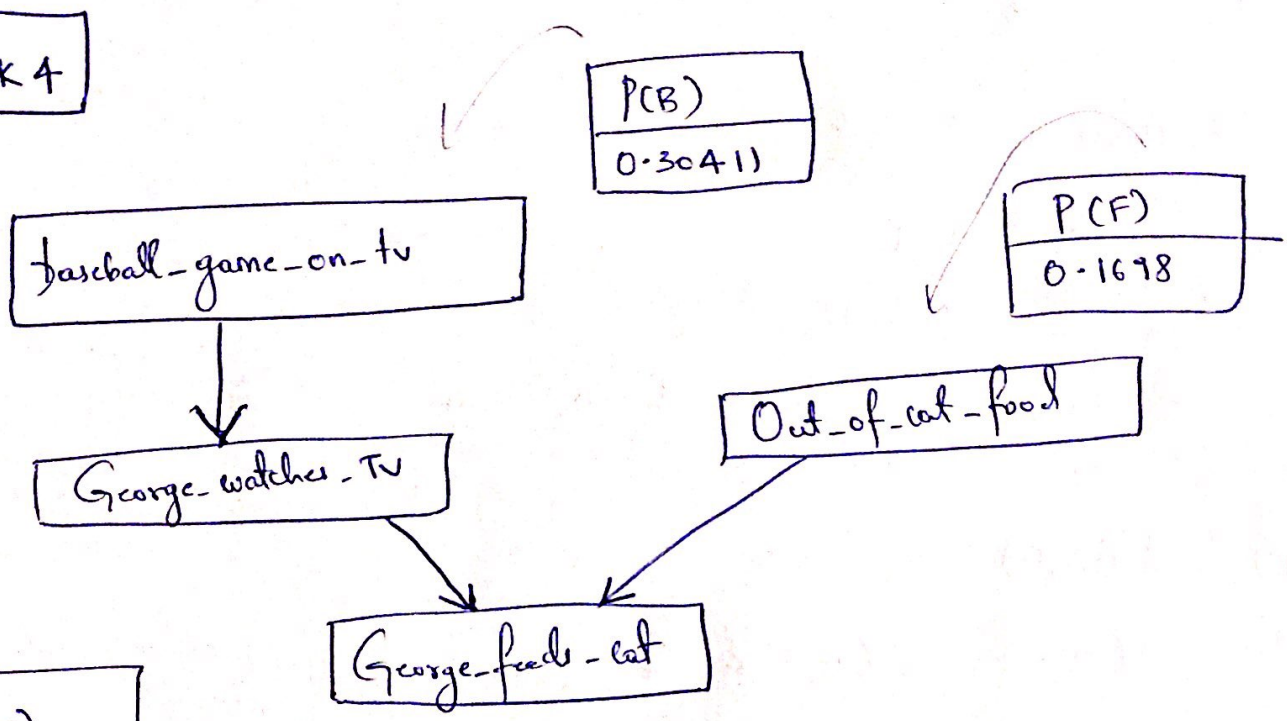
$= 304$ Values

TASK 3



Bayesian Network Design

TASK 4



B	P(T)
T	0.9279
F	0.1181

T: George watches TV
F: Out of Cat Food

T	F	P(C=T)	P(C=F)
T	T	0.0416	0.9583
T	F	0.7064	0.2935
F	T	0.3157	0.6842
F	F	0.9587	0.04124

P(B) = Probability of baseball game on TV

P(F) = Probability of out of cat food

P(T) = Probability of george watches TV

P(C) = Probability of george feeds cat.

Please find Excel Sheet ⇒ Task4.xlsx

TASKS

(A) Markovian Blanket of node L

Parent of L : G

Children of L is P, Q

Parents of Children of L is K, M

B) $P(A,F) = ?$

$$P(A,F) = P(A,F,K) + P(A,F,\neg K)$$

$$= \left[P(A) * P(F/A) * P(K/F) \right] +$$

$$\left[P(A) + P(F/A) * P\left(\frac{\neg K}{F}\right) \right]$$

$$= [0.8 \times 0.8 \times 0.3] + [0.8 \times 0.8 \times 0.7]$$

$$= 0.192 + 0.448$$

$$= 0.64$$

(c) $P(m, \text{not}(c) / H)$

$$= \frac{P(m, \text{not}(c), H)}{P(H)}$$

$$= \frac{P(m) * P(\text{not}(c)) * P(H)}{P(H,m,c) + P(H,m,\neg c) + P(H, \text{not}(m), c) + P(H, \text{not}(m), \text{not}(c))}$$

$$= \frac{0.1 * 0.4 * 0.1}{(0.1 * 0.1 * 0.4) + (0.6 * 0.6 * 0.1) + (0.6 * 0.9 * 0.6) + (0.1 * 0.9 * 0.4)}$$

$$= \frac{0.004}{0.004 \cdot 0.036 + 0.324 \cdot 0.036}$$

$$= \frac{0.004}{0.4}$$

$$= 0.01$$