**Programming Assignment 3**

**Inference in Bayesian Network**

**CS 6364**

Submitted by:

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**Query 1: [<A,f>][B]**

|  |  |  |  |
| --- | --- | --- | --- |
| No. of Samples | Prior Sampling | Rejection Sampling | Likelihood Weighting |
| 1 | 0.0 | 0.0 | 0.0 |
| 10 | 0.0 | 0.0 | 0.0 |
| 50 | 0.0 | 0.0 | 0.0 |
| 100 | 0.0 | 0.0 | 0.0 |
| 200 | 0.0 | 0.0005 | 0.002359977592959289 |
| 500 | 0.0006040306583323722 | 0.0 | 0.0012908369850970602 |
| 1000 | 0.0 | 0.0 | 0.0007517916849273948 |
| 10000 | 8.02095813911479e-05 | 6.000000000000001e-05 | 0.0009108544026832458 |
| Enumeration | 6.0131316971542564e-05 | x | x |

**Query 2: [<A,f>][J]**

|  |  |  |  |
| --- | --- | --- | --- |
| No. of Samples | Prior Sampling | Rejection Sampling | Likelihood Weighting |
| 1 | 0.0 | 0.0 | 0.0 |
| 10 | 0.06666666666666668 | 0.05 | 0.024444444444444456 |
| 50 | 0.042942176870748305 | 0.04000000000000001 | 0.055398066695890244 |
| 100 | 0.03541537827252113 | 0.06200000000000001 | 0.04146785084515805 |
| 200 | 0.04781229379219329 | 0.052500000000000005 | 0.04883315654564045 |
| 500 | 0.05085632762646379 | 0.0538 | 0.05834467594769479 |
| 1000 | 0.051283106920337884 | 0.0518 | 0.05051476421990542 |
| 10000 | 0.04991342762201904 | 0.049460000000000004 | 0.0502580961388037 |
| Enumeration | 0.049999999999999996 | x | x |

**Query 3: [<J,t> <E,f>][B]**

|  |  |  |  |
| --- | --- | --- | --- |
| No. of Samples | Prior Sampling | Rejection Sampling | Likelihood Weighting |
| 1 | 0.0 | 0.0 | 0.0 |
| 10 | 0.0 | 0.01 | 0.0 |
| 50 | 0.0 | 0.019999999999999997 | 0.0 |
| 100 | 0.016666666666666666 | 0.013000000000000001 | 0.0023434163712703054 |
| 200 | 0.03777777777777778 | 0.013500000000000002 | 0.0 |
| 500 | 0.010238095238095237 | 0.019399999999999997 | 0.0013752266841291364 |
| 1000 | 0.008724202626641652 | 0.0149 | 0.0008659531000739061 |
| 10000 | 0.015758054982892518 | 0.01616 | 0.0010092309643014645 |
| Enumeration | 0.01643814928511476 | x | x |

**Query 4: [<J,t> <E,f>][M]**

|  |  |  |  |
| --- | --- | --- | --- |
| No. of Samples | Prior Sampling | Rejection Sampling | Likelihood Weighting |
| 1 | 0.0 | 0.0 | 0.0 |
| 10 | 0.0 | 0.02 | 0.006666666666666663 |
| 50 | 0.0 | 0.027999999999999997 | 0.016326530612244733 |
| 100 | 0.05634920634920635 | 0.031000000000000007 | 0.010005405262639482 |
| 200 | 0.04802631578947368 | 0.0385 | 0.009889861659026394 |
| 500 | 0.04143172737322354 | 0.0328 | 0.011445210424267308 |
| 1000 | 0.04242274385326175 | 0.032499999999999994 | 0.011817202510007153 |
| 10000 | 0.03558489287752532 | 0.03368 | 0.011836872043382433 |
| Enumeration | 0.03331388442761261 | x | x |

**Query 5: [<M,t> <J,f>][B]**

|  |  |  |  |
| --- | --- | --- | --- |
| No. of Samples | Prior Sampling | Rejection Sampling | Likelihood Weighting |
| 1 | 0.0 | 0.0 | 0.0 |
| 10 | 0.0 | 0.02 | 0.0 |
| 50 | 0.0 | 0.006 | 0.0037396584353868905 |
| 100 | 0.0 | 0.006 | 0.0 |
| 200 | 0.0 | 0.0075 | 0.0022389398945853087 |
| 500 | 0.03333333333333333 | 0.007200000000000001 | 0.0021949404452023076 |
| 1000 | 0.0 | 0.005200000000000001 | 0.0008233178723387396 |
| 10000 | 0.009726078397302084 | 0.007549999999999999 | 0.000979071982834835 |
| Enumeration | 0.0068762460734210235 | x | x |

**Query 6: [<M,t> <J,f>][E]**

|  |  |  |  |
| --- | --- | --- | --- |
| No. of Samples | Prior Sampling | Rejection Sampling | Likelihood Weighting |
| 1 | 0.0 | 0.0 | 0.0 |
| 10 | 0.0 | 0.0 | 0.0 |
| 50 | 0.0 | 0.004 | 0.001976578932408656 |
| 100 | 0.0 | 0.011 | 0.0008888888888888485 |
| 200 | 0.0 | 0.009 | 0.005358397954861911 |
| 500 | 0.0 | 0.0052 | 0.0018653674840146627 |
| 1000 | 0.0 | 0.0058 | 0.001392385035554501 |
| 10000 | 0.005539072692951816 | 0.00615 | 0.0018755338922123311 |
| Enumeration | 0.005612151520557884 | x | x |