**Data Analysis and Modelling techniques – assignment 1**

2.2) Solution:

Probability of 10 year old computers having problem with MB, P(MB)=0.4

Probability of 10 year old computers having problem with HD, P(HD)=0.3

Probability of 10 year old computers having problem with MB and HD, P(MB HD)=0.15

Probability of computers having problem with either MB or HD, P(MB HD)

P(MB HD)=P(MB) + P(HD) - P(MB HD)

=0.4 + 0.3 – 0.15

=0.55

Probability of computers having no problem with MB or HD,

= 1 - P(MB HD)

= 1 – 0.55

= 0.45

* 1. Solution:

Portion of employees who know C/C++, C = 0.7

Portion of employees who know FORTRAN, F = 0.6

Portion of employees who knows C/C++ and FORTRAN, C F = 0.5

Portion of employees who knows either C/C++ or FORTRAN, C F,

=C + F - (C F)

=0.7 + 0.6 - 0.5

=0.8

Portion of employees who knows neither C/C++ nor FORTRAN ,

= 1 – (C F)

=1 – 0.8

=0.2

Portion of employees who know only C/C++,

C \ F = C – (C F)

=0.7 – 0.5

=0.2

**Portion of employees who do not know FORTRAN** = Portion of employees who know only C/C++ + Portion of employees who know neither FORTRAN or C/C++

=0.2 + 0.2

= 0.4

1. Portion of employees who do not FORTRAN and does not know C/C++ = 0.2

= 1 – (C F)

=1 – 0.8

=0.2

1. Portion of employees who know C/C++ but not FORTRAN,

C \ F = C – (C F)

=0.7 – 0.5

=0.2

1. Portion of employees who knows FORTRAN but not C/C++,

F \ C = F – (C F)

=0.6 – 0.5

=0.1

1. If someone knows FORTRAN, the probability that he/she C/C++ too,

P(C | F) =

=

= 0.833

1. If someone knows C/C++, the probability that he/she FORTRAN too,

P(F | C) =

=

=0.7143

* 1. Solution:

P(N) denote the probability of flights arriving on time

P(G) denote the probability of good weather condition

P(B) denote the probability of bad weather condition

Probability of flights arriving on time on good weather condition, P(N|G)=0.8

Probability of flights arriving on time on bad weather condition, P(N|B)=0.3

Probability of good weather tomorrow, P(G)=0.6

Probability of bad weather tomorrow, P(B)=0.4

Probability of flight arriving on time tomorrow = P(N)

P(N) =

=

=

=0.6

* 1. Solution:

Let A, B, C be the three key devices

Probability of A failing, P(A) = 0.01

Probability of B failing, P(B) = 0.02

Probability of C failing, P(C) = 0.02

Probability that shuttle will be launched on time, P( )=

=P()\*P()\*P()

=(1-P(A)) \* (1-P(B))\* (1-P(C))

=(1-0.01)(1-0.02)(1-0.02)

=0.9508

* 1. Solution:

Let A, B, C be 3 modules

Probability of module A working properly, P(A)=0.96

Probability of module B working properly, P(B)=0.95

Probability of module C working properly, P(C)=0.90

Probability that at least one of these three modules fail to work properly,

=1 – P(A B C)

=1 – P(A)\*P(B)\*P(C)

=1 – 0.96\*0.95\*0.90

=0.1792

* 1. Solution:

A, B, C are three viruses

Probability of A damaging the system, P(A) = 0.4

Probability of B damaging the system independent of A, P(B) = 0.5

Probability of C damaging the system independent of A and B, P(C) = 0.2

Probability of system getting damaged,

=1 – probability of system not getting damaged

Probability of system not getting damaged, P( )= P()\*P()\*P()

=(1-0.4)\*(1-0.5)\*(1-0.2)

=0.24

Probability of system getting damaged

=1 – 0.24

= 0.76

* 1. Solution:

The probability of error in first block, P(A) = 0.2

The probability of error in second block, P(B) = 0.3

P(A B) = P(A)\*P(B) (both are independent)

=0.2\*0.3

=0.06

Probability of error, P(E)=P(A) + P(B) – P(A B)

=0.2 + 0.3 – 0.06

= 0.44

Probability of error in both blocks given that program returns error =

=

= 0.1364

* 1. Solution:

X, Y, Z are 3 suppliers

P(X) probability of selecting a part supplied by X = 0.24

P(Y) probability of selecting a part supplied by Y = 0.36

P(Z) probability of selecting a part supplied by Z = 0.4

P(G) probability of selecting a good part

P(B) probability of selecting a defective part

Probability of defective parts from supplier X, P(B | X) = 0.05

Probability of defective parts from supplier Y, P(B | Y) = 0.1

Probability of defective parts from supplier Z, P(B | Z) = 0.06

Probability of selecting a defective part from supplier Z, P(Z | B) =

P(Z B) = P(B | Z) \* P(Z)

=0.06 \* 0.4

= 0.024

Probability of selecting a bad part, P(B) = P(B X) + P(B Y) + P(B Z)

=P(B | X)\*P(X) + P(B | Y)\*P(Y) + P(B | Z)\*P(Z)

=0.05\*0.24 + 0.1\*0.36 + 0.06\*0.4

=0.072

Probability of defective part being from supplier Z, P(Z | B) =

=

= 0.33

* 1. Solution:

Let G be the good part and B be the bad part

I denote the event for inspected parts and U denote the event for uninspected parts

P(I)=0.2

P(U)=0.8

Probability of selecting a defected part from inspected parts, P(B | I) = 0.05

Probability of selecting a defected part from uninspected parts, P(B | U) = 0.3

Probability of defective part, P(B) = P(B I) + P(B U)

=P(B | I)\*P(I) + P(B | U)\*P(U)

=0.05 \* 0.2 + 0.3 \* 0.8

=0.25

P(I B) =P(B | I) \* P(I)

=0.05 \* 0.2

=0.01

Probability of defective part went through the inspection, P(I | B) =

=

=0.04