

CENG 484 DATA MINING ASSIGNMENT 3 REPORT

a)

Number of classes : 5

Number of attributes : 4

b)

----- Single Rules -----

Total Rule Count: 27

Blood_Type = warm -> mammals
Blood_Type = warm -> birds
Blood_Type = cold -> reptiles
Blood_Type = cold -> fishes
Blood_Type = cold -> amphibians
Give_Birth = yes -> mammals
Give_Birth = yes -> fishes
Give_Birth = no -> reptiles
Give_Birth = no -> fishes
Give_Birth = no -> amphibians
Give_Birth = no -> birds
Give_Birth = no -> mammals
Can_Fly = no -> mammals
Can_Fly = no -> reptiles
Can_Fly = no -> fishes
Can_Fly = no -> amphibians
Can_Fly = no -> birds
Can_Fly = yes -> mammals
Can_Fly = yes -> birds
Live_Water = no -> mammals
Live_Water = no -> reptiles
Live_Water = no -> birds
Live_Water = yes -> fishes
Live_Water = yes -> mammals
Live_Water = sometimes -> amphibians
Live_Water = sometimes -> reptiles
Live_Water = sometimes -> birds

c)

----- Double Rules -----

Total Rule Count: 50

Blood_Type = warm ^ Give_Birth = yes -> mammals
Blood_Type = warm ^ Give_Birth = no -> birds
Blood_Type = warm ^ Give_Birth = no -> mammals
Blood_Type = cold ^ Give_Birth = yes -> fishes
Blood_Type = cold ^ Give_Birth = no -> reptiles
Blood_Type = cold ^ Give_Birth = no -> fishes
Blood_Type = cold ^ Give_Birth = no -> amphibians
Blood_Type = warm ^ Can_Fly = no -> mammals
Blood_Type = warm ^ Can_Fly = no -> birds
Blood_Type = warm ^ Can_Fly = yes -> mammals
Blood_Type = warm ^ Can_Fly = yes -> birds
Blood_Type = cold ^ Can_Fly = no -> reptiles
Blood_Type = cold ^ Can_Fly = no -> fishes
Blood_Type = cold ^ Can_Fly = no -> amphibians
Blood_Type = warm ^ Live_Water = no -> mammals
Blood_Type = warm ^ Live_Water = no -> birds
Blood_Type = warm ^ Live_Water = yes -> mammals
Blood_Type = warm ^ Live_Water = sometimes -> birds
Blood_Type = cold ^ Live_Water = no -> reptiles
Blood_Type = cold ^ Live_Water = yes -> fishes
Blood_Type = cold ^ Live_Water = sometimes -> amphibians
Blood_Type = cold ^ Live_Water = sometimes -> reptiles
Give_Birth = yes ^ Can_Fly = no -> mammals
Give_Birth = yes ^ Can_Fly = no -> fishes
Give_Birth = yes ^ Can_Fly = yes -> mammals
Give_Birth = no ^ Can_Fly = no -> reptiles
Give_Birth = no ^ Can_Fly = no -> fishes
Give_Birth = no ^ Can_Fly = no -> amphibians
Give_Birth = no ^ Can_Fly = no -> birds
Give_Birth = no ^ Can_Fly = no -> mammals
Give_Birth = no ^ Can_Fly = yes -> birds
Give_Birth = yes ^ Live_Water = no -> mammals
Give_Birth = yes ^ Live_Water = yes -> mammals
Give_Birth = yes ^ Live_Water = yes -> fishes
Give_Birth = no ^ Live_Water = no -> reptiles
Give_Birth = no ^ Live_Water = no -> birds
Give_Birth = no ^ Live_Water = no -> mammals
Give_Birth = no ^ Live_Water = yes -> fishes
Give_Birth = no ^ Live_Water = sometimes -> amphibians
Give_Birth = no ^ Live_Water = sometimes -> reptiles
Give_Birth = no ^ Live_Water = sometimes -> birds
Can_Fly = no ^ Live_Water = no -> mammals
Can_Fly = no ^ Live_Water = no -> reptiles
Can_Fly = no ^ Live_Water = yes -> fishes
Can_Fly = no ^ Live_Water = yes -> mammals

Can_Fly = no ^ Live_Water = sometimes -> amphibians
 Can_Fly = no ^ Live_Water = sometimes -> reptiles
 Can_Fly = no ^ Live_Water = sometimes -> birds
 Can_Fly = yes ^ Live_Water = no -> mammals
 Can_Fly = yes ^ Live_Water = no -> birds

d)

----- Triple Rules -----

Total Rule Count: 39

Blood_Type = warm ^ Give_Birth = yes ^ Can_Fly = no -> mammals
 Blood_Type = warm ^ Give_Birth = yes ^ Can_Fly = yes -> mammals
 Blood_Type = warm ^ Give_Birth = no ^ Can_Fly = no -> birds
 Blood_Type = warm ^ Give_Birth = no ^ Can_Fly = no -> mammals
 Blood_Type = warm ^ Give_Birth = no ^ Can_Fly = yes -> birds
 Blood_Type = cold ^ Give_Birth = yes ^ Can_Fly = no -> fishes
 Blood_Type = cold ^ Give_Birth = no ^ Can_Fly = no -> reptiles
 Blood_Type = cold ^ Give_Birth = no ^ Can_Fly = no -> fishes
 Blood_Type = cold ^ Give_Birth = no ^ Can_Fly = no -> amphibians
 Blood_Type = warm ^ Give_Birth = yes ^ Live_Water = no -> mammals
 Blood_Type = warm ^ Give_Birth = yes ^ Live_Water = yes -> mammals
 Blood_Type = warm ^ Give_Birth = no ^ Live_Water = no -> birds
 Blood_Type = warm ^ Give_Birth = no ^ Live_Water = no -> mammals
 Blood_Type = warm ^ Give_Birth = no ^ Live_Water = sometimes -> birds
 Blood_Type = cold ^ Give_Birth = yes ^ Live_Water = yes -> fishes
 Blood_Type = cold ^ Give_Birth = no ^ Live_Water = no -> reptiles
 Blood_Type = cold ^ Give_Birth = no ^ Live_Water = yes -> fishes
 Blood_Type = cold ^ Give_Birth = no ^ Live_Water = sometimes -> amphibians
 Blood_Type = cold ^ Give_Birth = no ^ Live_Water = sometimes -> reptiles
 Blood_Type = warm ^ Can_Fly = no ^ Live_Water = no -> mammals
 Blood_Type = warm ^ Can_Fly = no ^ Live_Water = yes -> mammals
 Blood_Type = warm ^ Can_Fly = no ^ Live_Water = sometimes -> birds
 Blood_Type = warm ^ Can_Fly = yes ^ Live_Water = no -> mammals
 Blood_Type = warm ^ Can_Fly = yes ^ Live_Water = no -> birds
 Blood_Type = cold ^ Can_Fly = no ^ Live_Water = no -> reptiles
 Blood_Type = cold ^ Can_Fly = no ^ Live_Water = yes -> fishes
 Blood_Type = cold ^ Can_Fly = no ^ Live_Water = sometimes -> amphibians
 Blood_Type = cold ^ Can_Fly = no ^ Live_Water = sometimes -> reptiles
 Give_Birth = yes ^ Can_Fly = no ^ Live_Water = no -> mammals
 Give_Birth = yes ^ Can_Fly = no ^ Live_Water = yes -> mammals
 Give_Birth = yes ^ Can_Fly = no ^ Live_Water = yes -> fishes
 Give_Birth = yes ^ Can_Fly = yes ^ Live_Water = no -> mammals
 Give_Birth = no ^ Can_Fly = no ^ Live_Water = no -> reptiles
 Give_Birth = no ^ Can_Fly = no ^ Live_Water = no -> mammals
 Give_Birth = no ^ Can_Fly = no ^ Live_Water = yes -> fishes
 Give_Birth = no ^ Can_Fly = no ^ Live_Water = sometimes -> amphibians
 Give_Birth = no ^ Can_Fly = no ^ Live_Water = sometimes -> reptiles
 Give_Birth = no ^ Can_Fly = no ^ Live_Water = sometimes -> birds
 Give_Birth = no ^ Can_Fly = yes ^ Live_Water = no -> birds

e)

----- All Rules -----

Total Rule Count: 116

Rule 0 ----- Blood_Type = warm -> mammals
Rule 1 ----- Blood_Type = warm -> birds
Rule 2 ----- Blood_Type = cold -> reptiles
Rule 3 ----- Blood_Type = cold -> fishes
Rule 4 ----- Blood_Type = cold -> amphibians
Rule 5 ----- Give_Birth = yes -> mammals
Rule 6 ----- Give_Birth = yes -> fishes
Rule 7 ----- Give_Birth = no -> reptiles
Rule 8 ----- Give_Birth = no -> fishes
Rule 9 ----- Give_Birth = no -> amphibians
Rule 10 ----- Give_Birth = no -> birds
Rule 11 ----- Give_Birth = no -> mammals
Rule 12 ----- Can_Fly = no -> mammals
Rule 13 ----- Can_Fly = no -> reptiles
Rule 14 ----- Can_Fly = no -> fishes
Rule 15 ----- Can_Fly = no -> amphibians
Rule 16 ----- Can_Fly = no -> birds
Rule 17 ----- Can_Fly = yes -> mammals
Rule 18 ----- Can_Fly = yes -> birds
Rule 19 ----- Live_Water = no -> mammals
Rule 20 ----- Live_Water = no -> reptiles
Rule 21 ----- Live_Water = no -> birds
Rule 22 ----- Live_Water = yes -> fishes
Rule 23 ----- Live_Water = yes -> mammals
Rule 24 ----- Live_Water = sometimes -> amphibians
Rule 25 ----- Live_Water = sometimes -> reptiles
Rule 26 ----- Live_Water = sometimes -> birds
Rule 27 ----- Blood_Type = warm ^ Give_Birth = yes -> mammals
Rule 28 ----- Blood_Type = warm ^ Give_Birth = no -> birds
Rule 29 ----- Blood_Type = warm ^ Give_Birth = no -> mammals
Rule 30 ----- Blood_Type = cold ^ Give_Birth = yes -> fishes
Rule 31 ----- Blood_Type = cold ^ Give_Birth = no -> reptiles
Rule 32 ----- Blood_Type = cold ^ Give_Birth = no -> fishes
Rule 33 ----- Blood_Type = cold ^ Give_Birth = no -> amphibians
Rule 34 ----- Blood_Type = warm ^ Can_Fly = no -> mammals
Rule 35 ----- Blood_Type = warm ^ Can_Fly = no -> birds
Rule 36 ----- Blood_Type = warm ^ Can_Fly = yes -> mammals
Rule 37 ----- Blood_Type = warm ^ Can_Fly = yes -> birds
Rule 38 ----- Blood_Type = cold ^ Can_Fly = no -> reptiles
Rule 39 ----- Blood_Type = cold ^ Can_Fly = no -> fishes
Rule 40 ----- Blood_Type = cold ^ Can_Fly = no -> amphibians
Rule 41 ----- Blood_Type = warm ^ Live_Water = no -> mammals
Rule 42 ----- Blood_Type = warm ^ Live_Water = no -> birds

Rule 43 ----- Blood_Type = warm ^ Live_Water = yes -> mammals
 Rule 44 ----- Blood_Type = warm ^ Live_Water = sometimes -> birds
 Rule 45 ----- Blood_Type = cold ^ Live_Water = no -> reptiles
 Rule 46 ----- Blood_Type = cold ^ Live_Water = yes -> fishes
 Rule 47 ----- Blood_Type = cold ^ Live_Water = sometimes -> amphibians
 Rule 48 ----- Blood_Type = cold ^ Live_Water = sometimes -> reptiles
 Rule 49 ----- Give_Birth = yes ^ Can_Fly = no -> mammals
 Rule 50 ----- Give_Birth = yes ^ Can_Fly = no -> fishes
 Rule 51 ----- Give_Birth = yes ^ Can_Fly = yes -> mammals
 Rule 52 ----- Give_Birth = no ^ Can_Fly = no -> reptiles
 Rule 53 ----- Give_Birth = no ^ Can_Fly = no -> fishes
 Rule 54 ----- Give_Birth = no ^ Can_Fly = no -> amphibians
 Rule 55 ----- Give_Birth = no ^ Can_Fly = no -> birds
 Rule 56 ----- Give_Birth = no ^ Can_Fly = no -> mammals
 Rule 57 ----- Give_Birth = no ^ Can_Fly = yes -> birds
 Rule 58 ----- Give_Birth = yes ^ Live_Water = no -> mammals
 Rule 59 ----- Give_Birth = yes ^ Live_Water = yes -> mammals
 Rule 60 ----- Give_Birth = yes ^ Live_Water = yes -> fishes
 Rule 61 ----- Give_Birth = no ^ Live_Water = no -> reptiles
 Rule 62 ----- Give_Birth = no ^ Live_Water = no -> birds
 Rule 63 ----- Give_Birth = no ^ Live_Water = no -> mammals
 Rule 64 ----- Give_Birth = no ^ Live_Water = yes -> fishes
 Rule 65 ----- Give_Birth = no ^ Live_Water = sometimes -> amphibians
 Rule 66 ----- Give_Birth = no ^ Live_Water = sometimes -> reptiles
 Rule 67 ----- Give_Birth = no ^ Live_Water = sometimes -> birds
 Rule 68 ----- Can_Fly = no ^ Live_Water = no -> mammals
 Rule 69 ----- Can_Fly = no ^ Live_Water = no -> reptiles
 Rule 70 ----- Can_Fly = no ^ Live_Water = yes -> fishes
 Rule 71 ----- Can_Fly = no ^ Live_Water = yes -> mammals
 Rule 72 ----- Can_Fly = no ^ Live_Water = sometimes -> amphibians
 Rule 73 ----- Can_Fly = no ^ Live_Water = sometimes -> reptiles
 Rule 74 ----- Can_Fly = no ^ Live_Water = sometimes -> birds
 Rule 75 ----- Can_Fly = yes ^ Live_Water = no -> mammals
 Rule 76 ----- Can_Fly = yes ^ Live_Water = no -> birds
 Rule 77 ----- Blood_Type = warm ^ Give_Birth = yes ^ Can_Fly = no -> mammals
 Rule 78 ----- Blood_Type = warm ^ Give_Birth = yes ^ Can_Fly = yes -> mammals
 Rule 79 ----- Blood_Type = warm ^ Give_Birth = no ^ Can_Fly = no -> birds
 Rule 80 ----- Blood_Type = warm ^ Give_Birth = no ^ Can_Fly = no -> mammals
 Rule 81 ----- Blood_Type = warm ^ Give_Birth = no ^ Can_Fly = yes -> birds
 Rule 82 ----- Blood_Type = cold ^ Give_Birth = yes ^ Can_Fly = no -> fishes
 Rule 83 ----- Blood_Type = cold ^ Give_Birth = no ^ Can_Fly = no -> reptiles
 Rule 84 ----- Blood_Type = cold ^ Give_Birth = no ^ Can_Fly = no -> fishes
 Rule 85 ----- Blood_Type = cold ^ Give_Birth = no ^ Can_Fly = no -> amphibians
 Rule 86 ----- Blood_Type = warm ^ Give_Birth = yes ^ Live_Water = no -> mammals
 Rule 87 ----- Blood_Type = warm ^ Give_Birth = yes ^ Live_Water = yes -> mammals
 Rule 88 ----- Blood_Type = warm ^ Give_Birth = no ^ Live_Water = no -> birds
 Rule 89 ----- Blood_Type = warm ^ Give_Birth = no ^ Live_Water = no -> mammals
 Rule 90 ----- Blood_Type = warm ^ Give_Birth = no ^ Live_Water = sometimes -> birds
 Rule 91 ----- Blood_Type = cold ^ Give_Birth = yes ^ Live_Water = yes -> fishes
 Rule 92 ----- Blood_Type = cold ^ Give_Birth = no ^ Live_Water = no -> reptiles
 Rule 93 ----- Blood_Type = cold ^ Give_Birth = no ^ Live_Water = yes -> fishes

Rule 94 ----- Blood_Type = cold ^ Give_Birth = no ^ Live_Water = sometimes -> amphibians
 Rule 95 ----- Blood_Type = cold ^ Give_Birth = no ^ Live_Water = sometimes -> reptiles
 Rule 96 ----- Blood_Type = warm ^ Can_Fly = no ^ Live_Water = no -> mammals
 Rule 97 ----- Blood_Type = warm ^ Can_Fly = no ^ Live_Water = yes -> mammals
 Rule 98 ----- Blood_Type = warm ^ Can_Fly = no ^ Live_Water = sometimes -> birds
 Rule 99 ----- Blood_Type = warm ^ Can_Fly = yes ^ Live_Water = no -> mammals
 Rule 100 ----- Blood_Type = warm ^ Can_Fly = yes ^ Live_Water = no -> birds
 Rule 101 ----- Blood_Type = cold ^ Can_Fly = no ^ Live_Water = no -> reptiles
 Rule 102 ----- Blood_Type = cold ^ Can_Fly = no ^ Live_Water = yes -> fishes
 Rule 103 ----- Blood_Type = cold ^ Can_Fly = no ^ Live_Water = sometimes -> amphibians
 Rule 104 ----- Blood_Type = cold ^ Can_Fly = no ^ Live_Water = sometimes -> reptiles
 Rule 105 ----- Give_Birth = yes ^ Can_Fly = no ^ Live_Water = no -> mammals
 Rule 106 ----- Give_Birth = yes ^ Can_Fly = no ^ Live_Water = yes -> mammals
 Rule 107 ----- Give_Birth = yes ^ Can_Fly = no ^ Live_Water = yes -> fishes
 Rule 108 ----- Give_Birth = yes ^ Can_Fly = yes ^ Live_Water = no -> mammals
 Rule 109 ----- Give_Birth = no ^ Can_Fly = no ^ Live_Water = no -> reptiles
 Rule 110 ----- Give_Birth = no ^ Can_Fly = no ^ Live_Water = no -> mammals
 Rule 111 ----- Give_Birth = no ^ Can_Fly = no ^ Live_Water = yes -> fishes
 Rule 112 ----- Give_Birth = no ^ Can_Fly = no ^ Live_Water = sometimes -> amphibians
 Rule 113 ----- Give_Birth = no ^ Can_Fly = no ^ Live_Water = sometimes -> reptiles
 Rule 114 ----- Give_Birth = no ^ Can_Fly = no ^ Live_Water = sometimes -> birds
 Rule 115 ----- Give_Birth = no ^ Can_Fly = yes ^ Live_Water = no -> birds

f)

----- Rank Rules According to Accuracy (TOP 10 RANK) -----

Rule 27: (Blood_Type = warm ^ Give_Birth = yes -> mammals)	Accuracy : 100.0 %
Rule 30: (Blood_Type = cold ^ Give_Birth = yes -> fishes)	Accuracy : 100.0 %
Rule 43: (Blood_Type = warm ^ Live_Water = yes -> mammals)	Accuracy : 100.0 %
Rule 44: (Blood_Type = warm ^ Live_Water = sometimes -> birds)	Accuracy : 100.0 %
Rule 45: (Blood_Type = cold ^ Live_Water = no -> reptiles)	Accuracy : 100.0 %
Rule 46: (Blood_Type = cold ^ Live_Water = yes -> fishes)	Accuracy : 100.0 %
Rule 51: (Give_Birth = yes ^ Can_Fly = yes -> mammals)	Accuracy : 100.0 %
Rule 57: (Give_Birth = no ^ Can_Fly = yes -> birds)	Accuracy : 100.0 %
Rule 58: (Give_Birth = yes ^ Live_Water = no -> mammals)	Accuracy : 100.0 %
Rule 64: (Give_Birth = no ^ Live_Water = yes -> fishes)	Accuracy : 100.0 %

----- Rank Rules According to Coverage (TOP 10 RANK) -----

Rule 12:	(Can_Fly = no -> mammals)	Coverage :	80.0 %
Rule 13:	(Can_Fly = no -> reptiles)	Coverage :	80.0 %
Rule 14:	(Can_Fly = no -> fishes)	Coverage :	80.0 %
Rule 15:	(Can_Fly = no -> amphibians)	Coverage :	80.0 %
Rule 16:	(Can_Fly = no -> birds)	Coverage :	80.0 %
Rule 7:	(Give_Birth = no -> reptiles)	Coverage :	65.0 %
Rule 8:	(Give_Birth = no -> fishes)	Coverage :	65.0 %
Rule 9:	(Give_Birth = no -> amphibians)	Coverage :	65.0 %
Rule 10:	(Give_Birth = no -> birds)	Coverage :	65.0 %
Rule 11:	(Give_Birth = no -> mammals)	Coverage :	65.0 %

g)

ID	Blood_Type	Give_Birth	Can_Fly	Live_Water	Class
Record1	warm	no	yes	no	?
Record2	warm	yes	no	yes	?
Record3	cold	yes	no	no	?
Record4	cold	no	no	yes	?

Answers by accuracy value:

Record1 ->	(Give_Birth = no ^ Can_Fly = yes -> birds)	(Rule Number 57)
Record2 ->	(Blood_Type = warm ^ Give_Birth = yes -> mammals)	(Rule Number 27)
Record3 ->	(Blood_Type = cold ^ Give_Birth = yes -> fishes)	(Rule Number 30)
Record4 ->	(Blood_Type = cold ^ Live_Water = yes -> fishes)	(Rule Number 46)

Answers by coverage value:

Record1 ->	(Give_Birth = no -> reptiles)	(Rule Number 7)
Record2 ->	(Can_Fly = no -> mammals)	(Rule Number 12)
Record3 ->	(Can_Fly = no -> mammals)	(Rule Number 12)
Record4 ->	(Can_Fly = no -> mammals)	(Rule Number 12)