Assignment 4

Task 1:
    Please see attached
      txt files.

Task2 -

Container 1
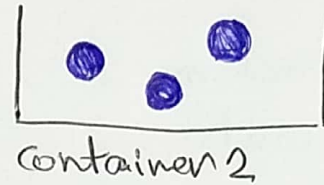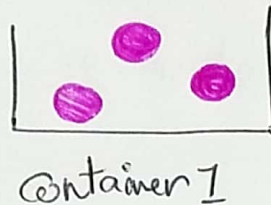
Container 2

Constants :

B_1, B_2, B_3

B_4, B_5, B_6

Predicates 8

BlueBall(x) : x is Blue

RedBall(x) : x is Red

Container1(x): x in Container 1

Container2(x): x in container 2

Initiate State 8

Container1(B_1) $\wedge$ Container1(B_2) $\wedge$ Container1(B_3) $\wedge$
RedBall(B_1) $\wedge$ RedBall(B_2) $\wedge$ RedBall(B_3) $\wedge$
Container2(B_4) $\wedge$ Container2(B_5) $\wedge$ Container2(B_6) $\wedge$
BlueBall(B_4) $\wedge$ BlueBall(B_5) $\wedge$ BlueBall(B_6)

Actions 8

MakeMarable (x, y)

Pre-Condition 8 Container1(x) $\wedge$ Container1(y) $\wedge$ BlueBall(x)
$\wedge$ RedBall(y)

Effect 8 $\neg$ Container1(x) $\wedge \neg$ Container1(y) $\wedge$ Container2(x) $\wedge$
Container2(y)

Move-To (x, y)

Pre-Condition 8 Container2(x) $\wedge$ Container2(y) $\wedge$ RedBall(x) $\wedge$
RedBall(y)

Effect : ¬Container2(x) ∧ ¬Container2(y) ∧ Container1(x)
∧ Container1(y)

Move - From -To (x, y)

Pre-Condition : Container2(x) ∧ Container2(y) ∧ BlueBall(x) ∧
BlueBall(y)

Effect : ¬Container2(x) ∧ ¬Container2(y) ∧ Container1(x)
∧ Container1(y)

Goal

Container1(B4) ∧ Container1(B5) ∧ Container1(B6)
Container2(B1) ∧ Container2(B2) ∧ Container2(B3)

Complete plan :

~~[scribbled out]~~
~~[scribbled out]~~
~~[scribbled out]~~

~~[scribbled out]~~
~~[scribbled out]~~
~~[scribbled out]~~

move -To(B1, B2)
movemavable(B1, B6)
movemavable(B2, B4)
move to (B1, B3)
movemavable(B1, B5)
move -To (B1, B2)

Task 3 -

Execution Monitoring / Online Replaning 8v

Here, will will Not make any change to the actions.

Here we need to handle domain when effect on action Not Deterministic.

But, when we start solve the problem we considered that problem as Deterministic, therefore, No change Required.

Conditional planning :- Since our problem has more than one outcome, So we have more than one Action. therefore, we will do changing.

8v

Move Marable $(+, y)$

Pre Conditions Container1 (x) $\wedge$ Container1 (y) $\wedge$ Blue Ball (x) $\wedge$ Red Ball (y)

EFFECTs $(\neg$ Container1 (x) $\wedge$ $\neg$ Container1 (y) $\wedge$ Container2 (x) $\wedge$

Container2 (y) $)$ $\vee$ $($ Container2 (x) $\wedge$ $\neg$ Container1 (x) $)$

$\vee$ $($ Container2 (y) $\wedge$ $\neg$ Container1 (y) $)$

Move -To (x, y)

Pre - Condition 8 Container2 (x) $\wedge$ Container2 (y) $\wedge$ Red Ball (x) $\wedge$ Red Ball (y)

EFFECTS $(\neg$ Container2 (x) $\wedge$ $\neg$ Container2 (y) $\wedge$ Container1 (x) $\wedge$ Container1 (y) $)$ $\vee$

$($ Container1 (x) $\wedge$ $\neg$ Container2 (x) $)$ $\vee$ $($ Container1 (y) $\wedge$ $\neg$ Container2 (y) $)$

Move -From -to (x, y)

Pre -Condition : Container2 $(x) \land$ container2 $(y) \land$ BlueBall $(x) \land$ BlueBall (y)

EFFECTs $\big((\neg$ Container2 $(x) \land \neg$ Container2 $(y)) \land$ Container1 $(x) \land$

Container1 $(y)\big) \lor \big($ Container1 $(x) \land \neg$ Container2 $(x)\big)\big)$

$\lor \big($ Container1 $(y) \land \neg$ Container2 $(y)\big)\big)$

Task 4 -

Predicates = 4
Constants = 5
Arguments = 3

for each possible predicate we need to check if predicate return true or false.

So, each predicate Take from 1 to 3 argument as max

To calculate Tigh Bound

$$\left[5 \times 4^1 \qquad 5 \times 4^3 \right]$$

$$\left[20 \qquad 500 \right]$$

⇒ predicate could be True or false

$$\left[2^{20} \qquad 2^{500} \right]$$ Number of unique States. in Jungle.