**ASSIGNMENT NO. 6**

**DEADLOCK AVAOIDANCE USING SEMAPHORE**

#include<stdio.h>

#include<semaphore.h>

#include<stdlib.h>

#include<pthread.h>

#define NUMBER 5

sem\_t s[5];

int state[NUMBER]={0}; //0 for think, 1 for hungry, 2 for Eating

pthread\_mutex\_t mutex;

void \*philosopher(void\* data);

void test(int);

void take\_forks(int );

void put\_forks(int );

void eat();

void think();

void eat()

{

sleep(3);

}

void think()

{

sleep(3);

}

void \*philosopher(void\* data)

{

int i, j=0;

while(j<5)

{

i=(int)data;

printf("\nPhilosopher %d is Thinking!!\n", i);

think();

printf("\nPhilosopher %d is Hungry!!\n", i);

take\_forks(i);

printf("\nPhilosopher %d is Eating!!\n", i);

eat();

printf("\nPhilosopher %d has Finished Eating and has Put down the fork!!\n", i);

put\_forks(i);

j++;

}

}

void take\_forks(int i)

{

pthread\_mutex\_lock(&mutex);

state[i]=1; //HUNGRY

printf("Value of Semaphore %d after Wait: %d\n",i, s[i]);

test(i);

pthread\_mutex\_unlock(&mutex);

sem\_wait(&s[i]);

}

void test(int i)

{

if(state[i]==1 && state[(i+(NUMBER-1))%NUMBER]!=2 && state[(i+1)%NUMBER]!= 2)

{

state[i]=2;

printf("\nPhilosopher %d has Picked Forks: %d and %d!!\n",i, (i+(NUMBER-1))%NUMBER, i);

sem\_post(&s[i]);

printf("\nFork %d is Picked\n", (i+(NUMBER-1))%NUMBER);

}

}

void put\_forks(int i)

{

pthread\_mutex\_lock(&mutex);

state[i]=0;

printf("Fork %d and %d is Released!!\n",(i+(NUMBER-1))%NUMBER, i);

test((i+(NUMBER-1))%NUMBER);

test((i+1)%NUMBER);

pthread\_mutex\_unlock(&mutex);

}

int main()

{

int i;

pthread\_t thread\_Id[NUMBER];

for(i=0; i<NUMBER; i++)

sem\_init(&s[i], 0, 0);

for(i=0; i<NUMBER ; i++)

pthread\_create(&thread\_Id[i], NULL, philosopher, (void\*)i);

for(i=0; i<NUMBER; i++)

pthread\_join(thread\_Id[i], NULL);

return 0;

}

**OUTPUT**

[it@localhost ~]$ gcc DiningPhilosopher.c -lpthread

[it@localhost ~]$ ./a.out

Philosopher 0 is Thinking!!

Philosopher 1 is Thinking!!

Philosopher 2 is Thinking!!

Philosopher 3 is Thinking!!

Philosopher 4 is Thinking!!

Philosopher 0 is Hungry!!

Philosopher 0 has Picked Forks: 4 and 0!!

Fork 4 is Picked

Philosopher 0 is Eating!!

Philosopher 1 is Hungry!!

Philosopher 2 is Hungry!!

Philosopher 2 has Picked Forks: 1 and 2!!

Fork 1 is Picked

Philosopher 2 is Eating!!

Philosopher 3 is Hungry!!

Philosopher 4 is Hungry!!

Philosopher 0 has Finished Eating and has Put down the fork!!

Fork 4 and 0 is Released!!

Philosopher 4 has Picked Forks: 3 and 4!!

Fork 3 is Picked

Philosopher 0 is Thinking!!

Philosopher 4 is Eating!!

Philosopher 2 has Finished Eating and has Put down the fork!!

Fork 1 and 2 is Released!!

Philosopher 1 has Picked Forks: 0 and 1!!

Fork 0 is Picked

Philosopher 2 is Thinking!!

Philosopher 1 is Eating!!

Philosopher 0 is Hungry!!

Philosopher 4 has Finished Eating and has Put down the fork!!

Fork 3 and 4 is Released!!

Philosopher 3 has Picked Forks: 2 and 3!!

Fork 2 is Picked

Philosopher 4 is Thinking!!

Philosopher 3 is Eating!!

Philosopher 2 is Hungry!!

Philosopher 1 has Finished Eating and has Put down the fork!!

Fork 0 and 1 is Released!!

Philosopher 0 has Picked Forks: 4 and 0!!

Fork 4 is Picked

Philosopher 1 is Thinking!!

Philosopher 0 is Eating!!

Philosopher 4 is Hungry!!

Philosopher 3 has Finished Eating and has Put down the fork!!

Fork 2 and 3 is Released!!

Philosopher 2 has Picked Forks: 1 and 2!!

Fork 1 is Picked

Philosopher 3 is Thinking!!

Philosopher 2 is Eating!!

Philosopher 1 is Hungry!!

Philosopher 0 has Finished Eating and has Put down the fork!!

Fork 4 and 0 is Released!!

Philosopher 4 has Picked Forks: 3 and 4!!

Fork 3 is Picked

Philosopher 0 is Thinking!!

Philosopher 4 is Eating!!

Philosopher 3 is Hungry!!

Philosopher 2 has Finished Eating and has Put down the fork!!

Fork 1 and 2 is Released!!

Philosopher 1 has Picked Forks: 0 and 1!!

Fork 0 is Picked

Philosopher 2 is Thinking!!

Philosopher 1 is Eating!!

Philosopher 0 is Hungry!!

Philosopher 4 has Finished Eating and has Put down the fork!!

Fork 3 and 4 is Released!!

Philosopher 3 has Picked Forks: 2 and 3!!

Fork 2 is Picked

Philosopher 4 is Thinking!!

Philosopher 3 is Eating!!

Philosopher 2 is Hungry!!

Philosopher 1 has Finished Eating and has Put down the fork!!

Fork 0 and 1 is Released!!

Philosopher 0 has Picked Forks: 4 and 0!!

Fork 4 is Picked

Philosopher 1 is Thinking!!

Philosopher 0 is Eating!!

Philosopher 4 is Hungry!!

Philosopher 3 has Finished Eating and has Put down the fork!!

Fork 2 and 3 is Released!!

Philosopher 2 has Picked Forks: 1 and 2!!

Fork 1 is Picked

Philosopher 3 is Thinking!!

Philosopher 2 is Eating!!

Philosopher 1 is Hungry!!

Philosopher 0 has Finished Eating and has Put down the fork!!

Fork 4 and 0 is Released!!

Philosopher 4 has Picked Forks: 3 and 4!!

Fork 3 is Picked

Philosopher 3 is Hungry!!

Philosopher 2 has Finished Eating and has Put down the fork!!

Fork 1 and 2 is Released!!

Philosopher 1 has Picked Forks: 0 and 1!!

Fork 0 is Picked

Philosopher 1 is Eating!!

Philosopher 4 is Eating!!

Philosopher 1 has Finished Eating and has Put down the fork!!

Fork 0 and 1 is Released!!

Philosopher 4 has Finished Eating and has Put down the fork!!

Fork 3 and 4 is Released!!

Philosopher 3 has Picked Forks: 2 and 3!!

Fork 2 is Picked

Philosopher 3 is Eating!!

Philosopher 3 has Finished Eating and has Put down the fork!!

Fork 2 and 3 is Released!!

[it@localhost ~]$