Operating System (CT-353) LAB 04 & 05

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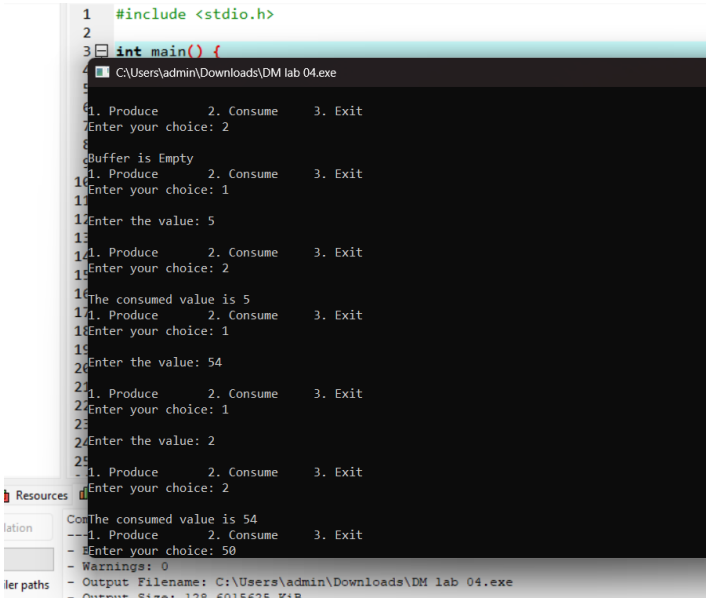
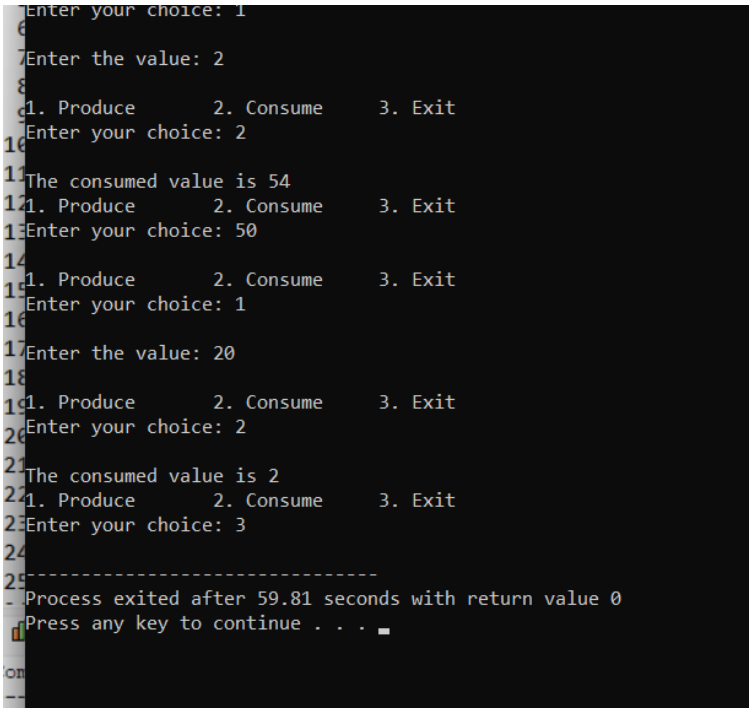
1) Implement the above code and paste the screen shot of the output.

CODE

```
#include <stdio.h>

int main() {
   int buffer[10], bufsize, in, out, produce, consume, choice = 0;
   in = 0;
   out = 0;
   bufsize = 10;

   while (choice != 3) {
      printf("\n1. Produce \t 2. Consume \t3. Exit");
      printf("\nEnter your choice: ");
      scanf("%d", &choice);

      switch (choice) {
         case 1:
            if ((in + 1) % bufsize == out)
               printf("\nBuffer is Full");
            else {
               printf("\nEnter the value: ");
               scanf("%d", &produce);
               buffer[in] = produce;
               in = (in + 1) % bufsize;
            }
            break;

         case 2:
            if (in == out)
               printf("\nBuffer is Empty");
            else {
               consume = buffer[out];
               printf("\nThe consumed value is %d", consume);
               out = (out + 1) % bufsize;
            }
            break;
      }
   }
}
```

OUTPUT


#include <stdio.h>
int main() {
C:\Users\admin\Downloads\DM lab 04.exe
1. Produce 2. Consume 3. Exit
Enter your choice: 2
Buffer is Empty
1. Produce 2. Consume 3. Exit
Enter your choice: 1
Enter the value: 5
1. Produce 2. Consume 3. Exit
Enter your choice: 2
The consumed value is 5
1. Produce 2. Consume 3. Exit
Enter your choice: 1
Enter the value: 54
1. Produce 2. Consume 3. Exit
Enter your choice: 1
Enter the value: 2
1. Produce 2. Consume 3. Exit
Enter your choice: 2
The consumed value is 54
1. Produce 2. Consume 3. Exit
Enter your choice: 50
Resources
- Warnings: 0
- Output Filename: C:\Users\admin\Downloads\DM lab 04.exe


Enter your choice: 1
Enter the value: 2
1. Produce 2. Consume 3. Exit
Enter your choice: 2
The consumed value is 54
1. Produce 2. Consume 3. Exit
Enter your choice: 50
1. Produce 2. Consume 3. Exit
Enter your choice: 1
Enter the value: 20
1. Produce 2. Consume 3. Exit
Enter your choice: 2
The consumed value is 2
1. Produce 2. Consume 3. Exit
Enter your choice: 3
Process exited after 59.81 seconds with return value 0
Press any key to continue . . .

2) Solve the producer-consumer problem using linked list. Note: Keep the buffer size to 10 places.

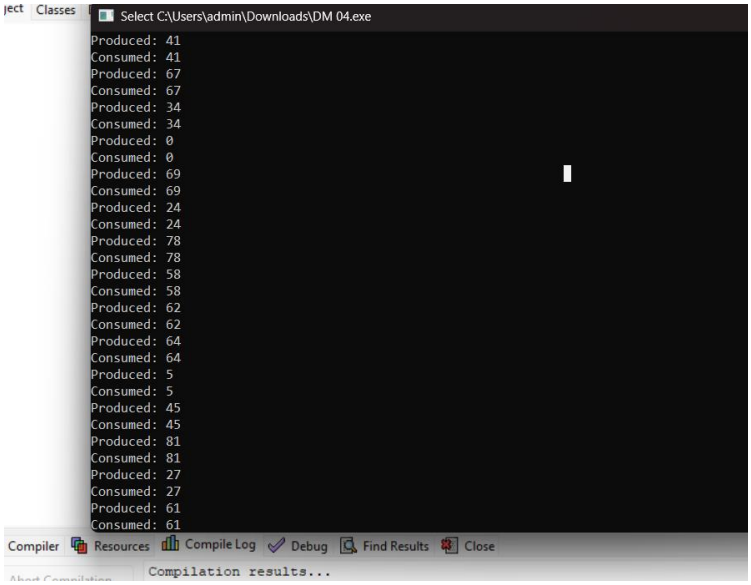
CODE

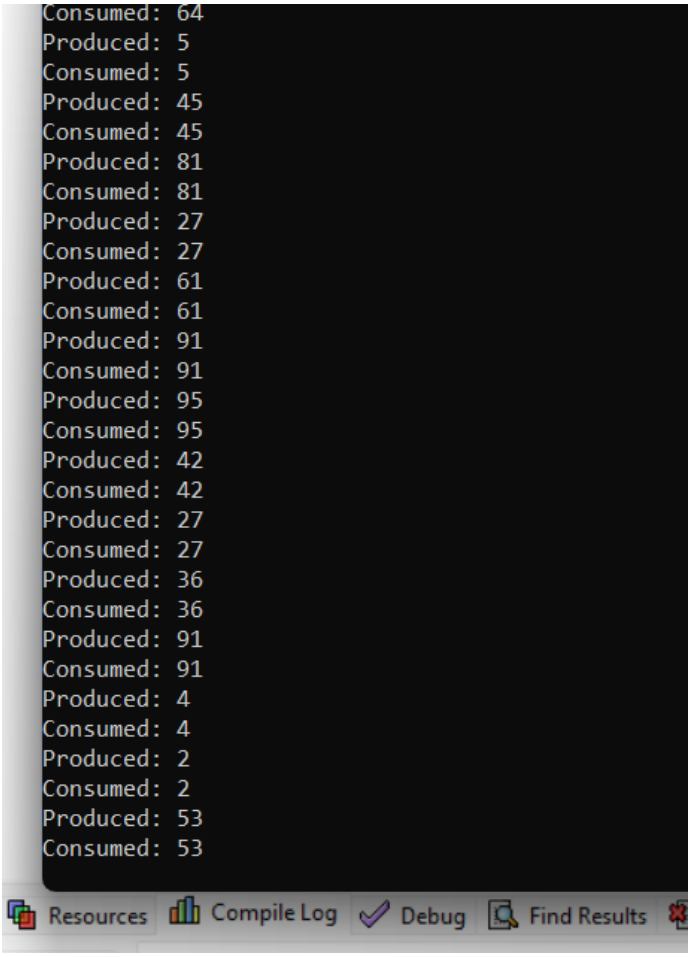
```
#include <stdio.h>
#define BUFFER_SIZE 10

typedef struct Node {
   int data;
   struct Node* next;
} Node;

Node* head = NULL;
Node* tail = NULL;
int count = 0;

pthread_mutex_t mutex;
sem_t empty, full;

void insert(int item) {
   Node* newNode = (Node*)malloc(sizeof(Node));
   newNode->data = item;
   newNode->next = NULL;

   if (tail == NULL) {
      head = tail = newNode;
   } else {
      tail->next = newNode;
      tail = newNode;
   }
   count++;
}

int remove_item() {
   if (head == NULL) return -1;

   Node* temp = head;
   int item = temp->data;
   head = head->next;
```

```
    if (head == NULL) tail = NULL;

    free(temp);
    count--;
    return item;
}

void* producer(void* arg) {
    int item;
    while (1) {
        item = rand() % 100;
        sem_wait(&empty);
        pthread_mutex_lock(&mutex);

        insert(item);
        printf("Produced: %d\n", item);

        pthread_mutex_unlock(&mutex);
        sem_post(&full);
        sleep(1);
    }
}

void* consumer(void* arg) {
    int item;
    while (1) {
        sem_wait(&full);
        pthread_mutex_lock(&mutex);

        item = remove_item();
        printf("Consumed: %d\n", item);

        pthread_mutex_unlock(&mutex);
        sem_post(&empty);
        sleep(1);
    }
}

int main() {
    pthread_t prod, cons;

    pthread_mutex_init(&mutex, NULL);
    sem_init(&empty, 0, BUFFER_SIZE);
    sem_init(&full, 0, 0);

    pthread_create(&prod, NULL, producer, NULL);
    pthread_create(&cons, NULL, consumer, NULL);
```

```
    pthread_join(prod, NULL);
    pthread_join(cons, NULL);

    pthread_mutex_destroy(&mutex);
    sem_destroy(&empty);
    sem_destroy(&full);
    return 0;
}
```

Output





3) In producer-consumer problem what difference will it make if we utilize stack for the buffer rather than an array?

Using a stack instead of a queue in the producer-consumer problem fundamentally changes the processing order from FIFO to LIFO, which may not be suitable for many traditional producer-consumer use cases.

1) Implement the above code and paste the screen shot of the output.

CODE

```
#include <semaphore.h>
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <pthread.h>

sem_t x, y;
pthread_t tid;
```

```
pthread_t writerthreads[100], readerthreads[100];
int readercount = 0;

void *reader(void *param) {
   sem_wait(&x);
   readercount++;

   if (readercount == 1) {
      sem_wait(&y);
   }
   sem_post(&x);

   printf("%d reader is inside\n", readercount);
   usleep(3);

   sem_wait(&x);
   readercount--;
   if (readercount == 0) {
      sem_post(&y);
   }
   sem_post(&x);
   printf("%d Reader is leaving\n", readercount + 1);
   return NULL;
}

void *writer(void *param) {
   printf("Writer is trying to enter\n");
   sem_wait(&y);
   printf("Writer has entered\n");
   sem_post(&y);
   printf("Writer is leaving\n");
   return NULL;
}

int main() {
   int n2, i;
   printf("Enter the number of readers:");
   scanf("%d", &n2);

   int n1[n2];
   sem_init(&x, 0, 1);
   sem_init(&y, 0, 1);

   for (i = 0; i < n2; i++) {
      pthread_create(&writerthreads[i], NULL, reader, NULL);
      pthread_create(&readerthreads[i], NULL, writer, NULL);
   }
```

```
    for (i = 0; i < n2; i++) {
        pthread_join(writerthreads[i], NULL);
        pthread_join(readerthreads[i], NULL);
    }

    return 0;
}
```

Output