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

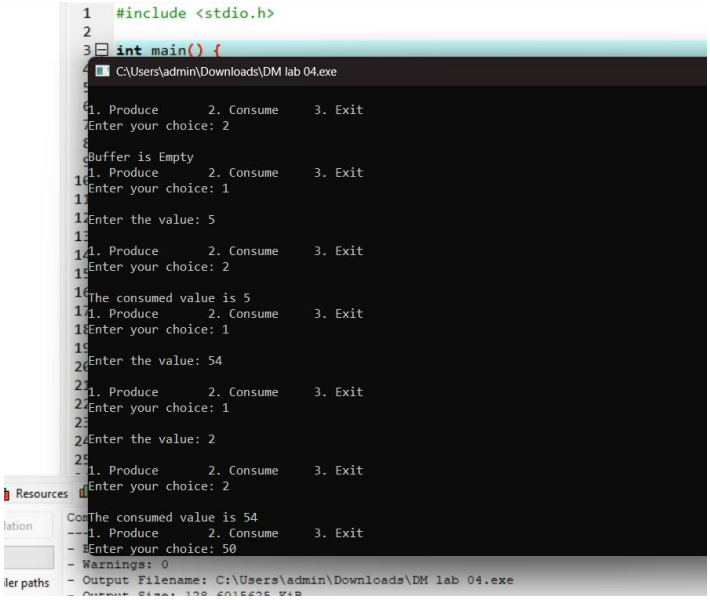
Code

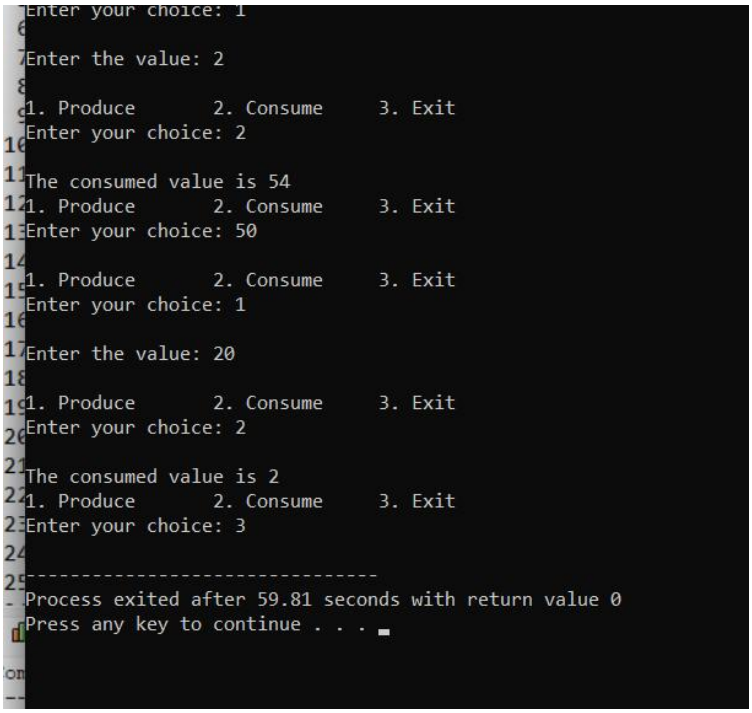
```
#include <stdio.h>

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;
      }
   }
}
```

M. HamzaKhan
DT-22048

Operating System (CT-353) LAB 04

Output





M. HamzaKhan
DT-22048

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;
```

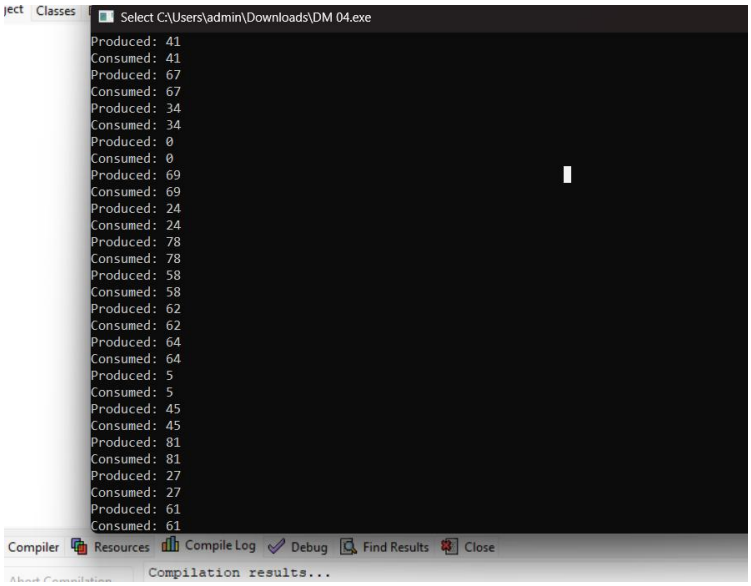
M. HamzaKhan
DT-22048

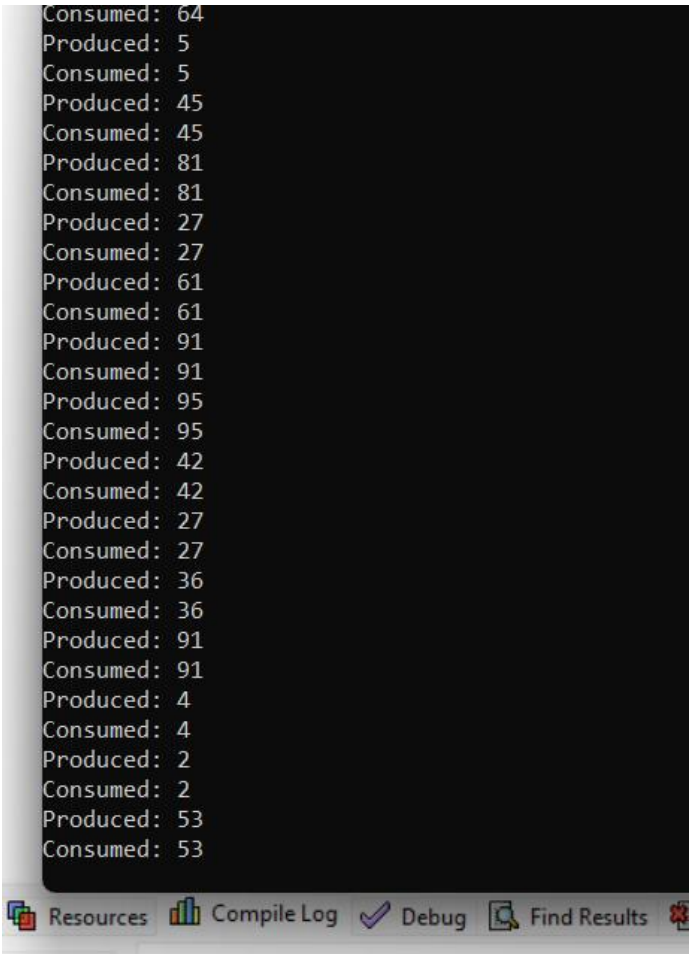
```
}

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);
```

M. HamzaKhan
DT-22048

```
    sem_destroy(&full);
    return 0;
}
```

Output





M. HamzaKhan
DT-22048

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.

M. HamzaKhan
DT-22048