Assignment 6
Operating Systems

Submitted to:
Department of Computer Science Engineering
Punjab Engineering College (Deemed to be University)
Chandigarh

Submitted by :
Navneet Yadav
SID: 21105127
Branch: ECE

Navneet Yadav
21105127
ECE

Assignment 5

Problem1:

Make a queue of user-defined length. Generate two threads, one would generate a random number and enqueue it. The second thread would help in dequeuing the same and printing those values.

Answer:

```
#!/bin/bash

QUEUE_FILE="shared_queue.txt"
> "$QUEUE_FILE"  # Clear previous data

# Ask user for queue size
read -p "Enter the maximum queue size: " QUEUE_SIZE

# Colors for output
GREEN="\033[0;32m"
RED="\033[0;31m"
NC="\033[0m"  # No color

# Producer Function
producer() {
   while true; do
       local size
       size=$(wc -l < "$QUEUE_FILE")
       if [ "$size" -lt "$QUEUE_SIZE" ]; then
           local value=$((RANDOM % 100))
           echo "$value" >> "$QUEUE_FILE"
```

```
            echo -e "${GREEN}[Producer] $(date +"%T") - Enqueued:
$value${NC}"
        fi
        sleep 1
    done
}

# Consumer Function
consumer() {
    while true; do
        if [ -s "$QUEUE_FILE" ]; then
            local value
            value=$(head -n 1 "$QUEUE_FILE")
            sed -i.bak '1d' "$QUEUE_FILE" && rm -f
"${QUEUE_FILE}.bak"
            echo -e "${RED}[Consumer] $(date +"%T") - Dequeued:
$value${NC}"
        fi
        sleep 2
    done
}

# Start producer and consumer as background processes
producer &
consumer &

# Keep script running
wait
```

Output:

```
(base) navneetyadav@Navneets-MacBook-Air OS_labs % /bin/bash "/Users/navneetyadav/Desktop/OS_labs/Assignment_6/ques1.sh"
Enter the maximum queue size: 5
[Producer] 22:43:34 - Enqueued: 13
[Producer] 22:43:35 - Enqueued: 72
[Consumer] 22:43:36 - Dequeued: 72
[Producer] 22:43:36 - Enqueued: 57
[Producer] 22:43:37 - Enqueued: 3
[Consumer] 22:43:38 - Dequeued: 3
[Producer] 22:43:38 - Enqueued: 96
[Producer] 22:43:39 - Enqueued: 81
[Consumer] 22:43:40 - Dequeued: 81
[Producer] 22:43:40 - Enqueued: 60
[Producer] 22:43:41 - Enqueued: 89
[Consumer] 22:43:42 - Dequeued: 89
[Producer] 22:43:42 - Enqueued: 9
[Producer] 22:43:43 - Enqueued: 4
[Consumer] 22:43:44 - Dequeued: 4
[Producer] 22:43:44 - Enqueued: 28
[Producer] 22:43:45 - Enqueued: 29
[Consumer] 22:43:46 - Dequeued: 29
[Producer] 22:43:46 - Enqueued: 21
[Producer] 22:43:47 - Enqueued: 4
[Consumer] 22:43:48 - Dequeued: 4
[Producer] 22:43:48 - Enqueued: 95
[Producer] 22:43:49 - Enqueued: 69
```

<u>Problem 2</u>:

In computing, the producer-consumer problem (also known as the bounded-buffer problem) is a classic example of a multi-process synchronization problem. The problem describes two processes, the producer and the consumer, which share a common, fixed-size buffer used as a queue.

• The producer's job is to generate data, put it into the buffer, and start again.

• At the same time, the consumer is consuming the data (i.e., removing it from the buffer), one piece at a time.

Answer:

```
#!/bin/bash


BUFFER_SIZE=5
BUFFER=()


# Colors
YELLOW="\033[1;33m"
```

```
BLUE="\033[1;34m"
NC="\033[0m"

produce() {
   while true; do
       if [ "${#BUFFER[@]}" -lt "$BUFFER_SIZE" ]; then
           item=$((RANDOM % 1000))
           BUFFER+=("$item")
           echo -e "${YELLOW}[Producer] $(date +"%T") -
Produced: $item | Buffer Size: ${#BUFFER[@]}${NC}"
       else
           echo -e "${YELLOW}[Producer] $(date +"%T") - Buffer
is full, waiting...${NC}"
       fi
       sleep 1
   done
}

consume() {
   while true; do
       if [ "${#BUFFER[@]}" -gt 0 ]; then
           item="${BUFFER[0]}"
           BUFFER=("${BUFFER[@]:1}")
           echo -e "${BLUE}[Consumer] $(date +"%T") - Consumed:
$item | Buffer Size: ${#BUFFER[@]}${NC}"
       else
           echo -e "${BLUE}[Consumer] $(date +"%T") - Buffer is
empty, waiting...${NC}"
       fi
       sleep 2
   done
}
```

```
# Run in background
produce &
consume &

# Wait forever
wait
```

Output:

```
/bin/bash "/Users/navneetyadav/Desktop/OS_labs/Assignment_6/ques2.sh"
[Consumer] 22:48:18 - Dequeued: 6
[Producer] 22:48:18 - Enqueued: 79
[Consumer] 22:48:20 - Dequeued: 25
[Producer] 22:48:20 - Enqueued: 31
[Consumer] 22:48:22 - Dequeued: 30
[Producer] 22:48:22 - Enqueued: 93
[Consumer] 22:48:24 - Dequeued: 13
[Producer] 22:48:24 - Enqueued: 30
[Consumer] 22:48:26 - Dequeued: 97
[Producer] 22:48:26 - Enqueued: 17
[Consumer] 22:48:28 - Dequeued: 79
[Producer] 22:48:28 - Enqueued: 24
[Consumer] 22:48:30 - Dequeued: 31
[Producer] 22:48:30 - Enqueued: 87
[Consumer] 22:48:32 - Dequeued: 93
[Producer] 22:48:32 - Enqueued: 21
[Consumer] 22:48:34 - Dequeued: 30
[Producer] 22:48:34 - Enqueued: 67
[Consumer] 22:48:36 - Dequeued: 17
[Producer] 22:48:36 - Enqueued: 95
[Consumer] 22:48:38 - Dequeued: 24
[Producer] 22:48:38 - Enqueued: 20
[Consumer] 22:48:40 - Dequeued: 87
[Producer] 22:48:40 - Enqueued: 82
```