Operating System Practical Exam
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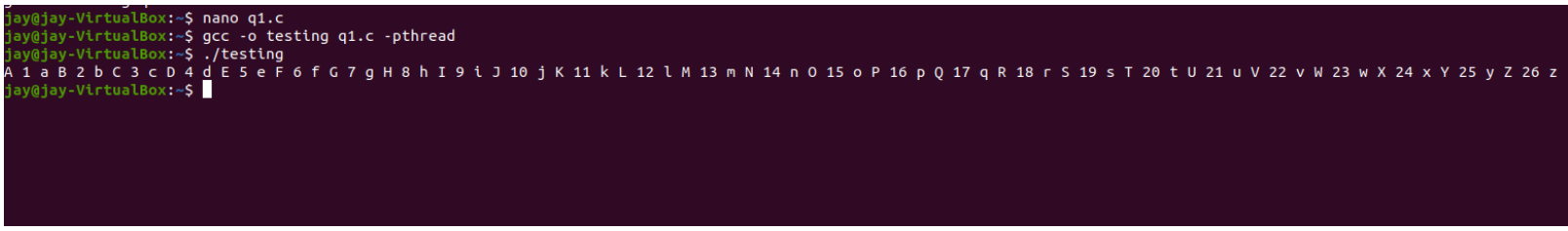
Section - 2

Ans-1



In this question we have to print the above output displayed in the screenshot and for that the output is generated utilising the semaphore and threads in this case. The flag variable functions similarly to the counter, now we'll make three threads with the names tid1, tid2, and tid3, correspondingly. We are now utilising three functions to execute them: capital function, num function and lowercase function for threads tid1, tid2, and tid3. Iterating over a for loop from 0 to 26 is used in capita function(). And we're waiting for the semaphore to gain access to the shared variable in each iteration. The loop index 'i+ A' is then printed if the value of the flag variable modulo 3 is zero.Otherwise, we decrease the loop index i only to get another iteration. The num_function() and lowercase_function() functions are similar to capital_function() in that they print numerals and alphabets in lowercase. We utilise the inbuilt method 'pthread create()' to new the three threads in the main function, and then we use pthread join for each thread, which acts as a wait() for all of the threads to finish their jobs.

Ans-2

For allocation of memory and deallocation of memory

```
jay@jay-VirtualBox:~$ nano que2-2.cpp
jay@jay-VirtualBox:~$ g++ -std=c++17 que2-2.cpp
jay@jay-VirtualBox:~$ ./a.out
Memory from 0 to 15 allocation
Memory from 16 to 31 allocated
Memory from 32 to 47 allocation
Memory from 48 to 63 allocated
Memory block from 0 to 15 freed
Sorry, invalid free request
Memory block from 32 to 47 freed
Memory block from 16 to 31 freed
Coalescing of blocks starting at 0 and 16 was done
jay@jay-VirtualBox:~$
```

Buddy's method is a memory management system that allocates and deallocates memory when a system has problems allocating memory for new processes or when the memory is full. The RAM in this system is increased by 2 and the unallocated block is merged in order to free up memory for other processes that may require it.

For allocation of the memory using Buddy's algorithm

- We generate and maintain a list of powers of two, such as 1,2,4, and so on, in the memory allocation section.
- When a user requests memory, this technique locates the block that is just slightly larger than the requested block.
- For example, if we need 50 kilobytes of RAM, the method will provide 64 kilobytes. If the algorithm does not discover the block, it will continue looking for a block with more memory than the required memory.

For deallocation of the memory block.

- During the memory allocation period, we will construct another map and store the key and value in the map.
- We'll use the address as a key and the required RAM as a value.
- When memory deallocation is requested, we first examine the key value pair, and if it is legitimate, we deallocate the memory and add it to the free list.

Ans-3

```
jay@jay-VirtualBox:~$ ./test
Producer 1: Insert Item 1804289383 at 0
Producer 1: Insert Item 1957747793 at 1
Producer 3: Insert Item 1681692777 at 2
Producer 4: Insert Item 1714636915 at 3
Producer 2: Insert Item 846930886 at 4
Consumer 1: Remove Item 1804289383 from 0
Consumer 1: Remove Item 1957747793 from 1
Consumer 1: Remove Item 1681692777 from 2
Producer 5: Insert Item 1649760492 at 0
Consumer 2: Remove Item 1714636915 from 3
Consumer 2: Remove Item 846930886 from 4
Producer 2: Insert Item 1189641421 at 1
Producer 1: Insert Item 424238335 at 2
Consumer 3: Remove Item 1649760492 from 0
Producer 3: Insert Item 719885386 at 3
Producer 3: Insert Item 1102520059 at 4
Producer 4: Insert Item 596516649 at 0
Consumer 2: Remove Item 1189641421 from 1
Consumer 2: Remove Item 424238335 from 2
Producer 2: Insert Item 1350490027 at 1
Producer 2: Insert Item 1365180540 at 2
```