INTERNATIONAL ISLAMIC UNIVERSITY ISLAMABAD

Faculty of Basic & Applied Sciences

Department of Computer Science & Software Engineering

FINAL EXAMINATIONS, Fall 2021

<CS-224 Operating Systems> Question Paper

Time allowed: 06 Hrs (3 hours for attempt, 3 hours for uploading)

Total Marks: 60

Instruction

1. *Attempt all the questions by hand on white sheets.*
2. *Download the file **OS-Final-Answer.docx** file (File attached in the Midterm Activity in Google Classroom).*
3. *Type in your name and registration number on the first page of the word file in the space provided.*
4. *Take screens shots of the answer sheets.*
5. *Embed those screenshots in the file **OS-Final-Answer.docx**.*
6. *Save the **OS-Final-Answer.docx** as a pdf document.*
7. *Upload the **OS-Final-Answers.pdf** file on the link provided in the Google Classroom on the question paper.*
8. *All questions are compulsory.*

Q1: Briefly write down the differences between following: [4x3=12]

a. Page MAP Table in memory & TLB
b. Optimal & LRU (Least Recently Used) Page Replacement Policies
c. Semaphores & Monitors

Q2: Explain and draw figure where necessary. [4+6=10]

a. What happens if the page size is kept ***very low*** and **very *high*?**

b. Find out the average waiting time and average turnaround time of the following processes using ***Preemptive Priority Scheduling*** method.

Process	Arrival Time	Priority	Execution Time
P1	0	3	7
P2	1	2	4
P3	1	1	5
P4	4	1	2

Q3: Briefly Explain. (Note: Sequence is mandatory) **[3x5=15]**

a. How much bits (bitmaps) are needed to track memory of size 4MB that uses allocation unit (block) size 1024 bytes?
b. Compute effective access time if TLB search needs 20 ns and 100 ns are required to Access Memory for 70% TLB hit ratio.
c. What is drawback of Strict Alteration approach to implement Mutual Exclusion?
d. How can we give priority to Writers over the readers in an algorithm for Writers using Monitors?
e. How does the system increase the priority of a process in Multi-level Feedback queue that faces starvation?

Q4: A system implements a paged virtual address space for each process using a one-level page table. The maximum size of an address space is 16 megabytes. **[8]**

The page table for the running process includes the following entries:

Page Number	**Frame Number**
0	4
1	8
2	16
3	17
4	9

The page size is 1024 bytes and the maximum physical memory size of the machine is 2 megabytes. Assuming two bits for protection and reference etc.

a) How many bits are required for each page table entry?
b) What is the maximum number of entries in a page table?
c) How many bits are there in a virtual address?

Q5. Why is there a need to create child process in Linux? What does fork() function do? **[5]**

Q6. Write programs in C language to: **[5+5=10]**

a. Obtain process ID and then create a child process. Get the process ID of the child process.

b. Control the semaphore with the key having digits from your registration number as per following requirements.

1. Create a new semaphore and display its ID.
2. Retrieve the current semaphore count.

Note: Display appropriate messages. Provide comments with the code.