Date: 11/10/2020

AHSANULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Department of Computer Science and Engineering
Program: B.Sc. in Computer Science and Engineering
Semester Final Examination, Fall-2019

Part A

Year: 3rd **Course No: CSE3213**

Semester: 2nd **Course Name: Operating System**

Time: 2 (Two) hours **Full marks: 40**

Use Single answer script

Instructions:	i)	Answer script should be hand written and should be written in A4 white paper. You must submit the hard copy of this answer script to the Department when the university reopens.
	ii)	Write down Student ID, Course number, and put your signature on top of every single page of the answer script
	iii)	Write down page number at the bottom of every page of the answer script.
	iv)	Upload the scan copy of your answer script in PDF format at the respective site of the course at **google classroom** using institutional email within the allocated time. Uploading clear and readable scan copy is your responsibility and must be covered the full page of your answer script.
	v)	You must avoid **plagiarism,** maintain **academic integrity, and ethics**. You are not allowed to take any help from another individual and if taken so can result in stern disciplinary actions from the university authority

Part A

Instructions:	i)	Before uploading rename the PDF file as **CourseNo_StudentID_PartNo** e.g.CSE3213_170104060_partA.pdf
	ii)	There are **5 (Five) Questions, Answer any 4 (Four)**
	iii)	Marks allotted are indicated in the **right margin**
	iv)	Necessary **charts/tables** are attached at the end of the question paper
	v)	Assume any reasonable data if needed
	vi)	Symbols and characters have their usual meaning

Question 1. [Marks: 10]

a) Explain the Microkernel Operating System architecture. How does an Operating System recover from a deadlock? **[3+2]**

b) With an example, explain a situation where you should create a new thread instead of a new process. Distinguish the differences between the Type-1 and Type-2 hypervisors in a Virtual Machine Operating System. **[3+2]**

Question 2. [Marks: 10]

a) What is the difference between symmetric and asymmetric multiprocessing used in a multi-processor scheduling system? Given the following data, find the average turn-around time and average response time using the Round-Robin process scheduling algorithm. **[1+4]**

Process	**Arrival time**	**CPU burst time**
P1	37	11
P2	8	12
P0	6	9
P4	0	14
P5	13	12
P3	16	6
P6	37	14

Time quantum q = 3

b) Explain Race condition with necessary examples. Rewrite the *Peterson's solution* for handling race-condition among *n*-number of processes accessing a shared resource and also explain your solution with any one scenario. **[2+3]**

Question 3. [Marks: 10]

a)	Requests for reading operations from the data blocks residing in the following cylinders are given below. 122 16 13 1 52 57 19 180 70 37 62 12 29 10 390 79 310 411 Analyze the following disk scheduling algorithms in terms of total number of cylinder movements and conclude which one is better with reasons. i) *Shortest Seek Time First* ii) *C-Look* Assume that the cylinders are numbered from 0 to 500 and the disk head is currently positioned over the cylinder number 48. The disk head is moving towards the higher numbered cylinders. In the case of *C-Look* algorithm, assume that the disk head serves any cylinder request while moving from higher to lower numbered cylinders only.	**[5]**
b)	Explain the hard and soft-linking of a file in a Unix-like file-system using examples. With an 8KB data sector size, what could be the maximum file size using a Unix inode data structure? Assume that, each data pointer takes 2-bytes of disk space.	**[2+3]**

Question 4. [Marks: 10]

a)	Explain how does a Translation Look-aside Buffer (TLB) reduces memory access time? With the necessary figure, show how does an Operating System performs address translation with a TLB and virtual memory.	**[2+3]**
b)	Translate the following address issued by a process to its corresponding primary memory address with the following information. The symbols have their usual meaning. Page Size: 32 KB RAM size: 2 GB Address space size of a process: 512 MB The process requests a data from its 230^{th} page with offset being 1200. The data is located in the 20^{th} frame number in the primary memory. Note that you must show all the intermediate steps.	**[5]**

Question 5. [Marks: 10]

a)	Answer the following questions in brief. i) Why does an Operating System (OS) may use a multi-level page table? ii) Why does an OS maintain process control block per process? iii) Why the global memory page replacement may cause thrashing? iv) Why is an OS called a Kernel? v) How can a deadlock be prevented by attacking the circular wait condition?	**[5x1=5]**
b)	With an example, show the linked list-based technique to manage free memory space in a fixed memory partition system. Explain the use of different types of semaphores with necessary examples.	**[2+3]**

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Department of Computer Science and Engineering
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Semester Final Examination, Fall-2019

Part-B (Open book exam)

Year: 3rd **Course No: CSE3213**

Semester: 2nd **Course Name: Operating System**

Submission deadline: Next day 6.30 pm **Full marks: 20**

Use Single answer script

Instructions:	i)	Before uploading rename the PDF file as **CourseNo_StudentID_PartNo** e.g. CSE3213_170104062_partB.pdf
	ii)	**Answer all the Questions**
	iii)	Marks allotted are indicated in the **right margin**
	iv)	Necessary **charts/tables** are attached at the end of the question paper
	v)	Assume any reasonable data if needed
	vi)	Symbols and characters have their usual meaning

Question 1. [Marks: 10]		
	Given the following data, present a 3-level page table structure in a demand paging system and also show the logical address generation process for the local address. Symbols used in the question have their standard meaning. Total address space of the process: 8MB Page size: 4KB The process wants to access its local address: 16385 Note that you have the freedom to generate the multi-level index in any permissible way.	**[10]**

Question 2. [Marks: 10]

Consider the following figure (Fig. 1) and the supporting data in the table (table 1). Now, find the average turn-around time. Do you think this queue arrangement is an appropriate selection? **[10]**

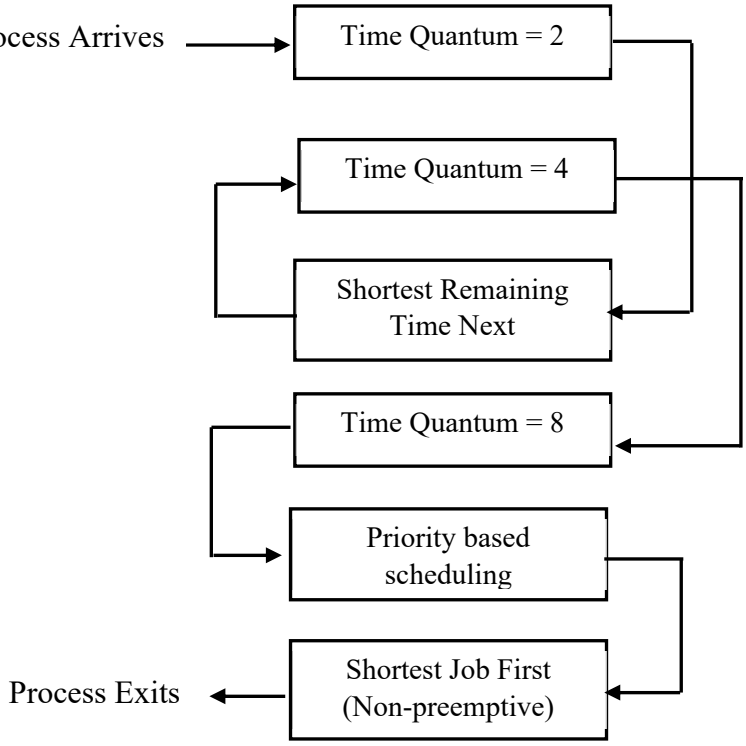

Fig.1 : Multilevel Feedback Queue

Table 1: Processes information

Process ID	Priority	Arrival Time	Estimated CPU burst
P0	1	5	28
P1	9	8	26
P2	10	0	12
P3	2	48	17
P4	7	51	21
P5	6	56	20
P6	5	60	12
P7	9	36	6
P8	9	28	19
P9	6	22	9
P10	8	10	17

	Note the following: i) In the case of a non-preemptive queue (mentioned in the queue label), if a process is given CPU allocation, it cannot be removed from the CPU until it finishes its remaining time. ii) In the case of a preemptive queue, a process must be removed from the CPU as per the scheduling criteria or if there is any process available in the preceding queues. iii) The priority queue is pre-emptive in terms of higher priority values. In the case of priority, the higher value represents a higher priority. iv) Round Robin queues are non-preemptive until the time quantum value expires.	