SPRING SEMESTER EXAMINATION-2020(online)

4th Semester B. Tech~~, 2nd Semester B. Tech &2nd Semester M. Tech~~

SCHOOL OF COMPUTER ENGINEERING

~~DEPARTMENT ELECTIVE / OPEN ELECTIVE~~

OPERATING SYSTEM

CS 2002

Time: 2 Hours Full Marks: 50

(SECTION-A:1 Hour, SECTION-B:1 Hour)

Question paper consists of two sections-A, B.
Section A is compulsory.
Attempt any TWO questions from Sections B.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words

SECTION-A (Time: 1 Hour)			
			MARK
1.	(a)	Let's assume you are designing a preemptive scheduling algorithm where the primary concern is the **fairness** among the process execution time. Suggest which algorithm would you choose to maintain fairness and why?	[2.5]
	(b)	Apply your suggested algorithm to the following problem: Let there be 4 processes, all are arriving at time zero, with total execution time of 10, 20, 30 and 40 units	[10]

KIIT-DU/2020/SOT/Spring End Semester Examination-2020

respectively. Each process spends the first 10% of execution time doing I/O, the next 70% of time doing computation, and the last 20% of time doing I/O. Assume that all I/O operations can be overlapped as much as possible. For what percentage does the CPU remain idle? What would be the average turnaround time and average response time?

2. (a) Write down WAIT( ) and SIGNAL( ) operations on counting semaphore. [2.5]

(b) Consider a ticket counter where a single employee is sitting to provide tickets to many travelers in one by one basis. At any time more than one traveler can come to the waiting hall. One traveler can book only one ticket. There is a box similar to buffer having unlimited number of slots where the travelers have to put his travel request from. When the box is accessed by the employee, he takes the request form one at a time, and books the ticket based on the detail given on the request form and put the ticket in the same slot so that the corresponding traveler can collect his ticket and release the slot. Once the slot gets empty that can be used by another traveler for putting his travel request form. The slots of the box will be accessed by the travelers and employee in a sequential manner (i.e. 0, 1, 2, 3 ...). Write separate functions for traveler and employee (using semaphore and WAIT ( )/SIGNAL ( ) operation) with ensuring no race condition even if multiple travelers and employee access the same box as buffer. [10]

SECTION-B(Time:1 Hour)

3. (a) What are the possible recovery strategies once any deadlock is detected in a system? Explain briefly. [4.5]

(b) Consider the following snapshot of a system with 5 processes (P_0, P_1, P_2, P_3, P_4) and 3 resource types (R_0, R_1, $R_{2,}$): [8]

Process	Max Need			Allocation			Available		
	R_0	R_1	R_2	R_0	R_1	R_2	R_0	R_1	R_2
P_0	0	4	1	0	1	1	1	T	2
P_1	1	5	U	1	0	0			
P_2	2	3	5	1	1	5			
P_3	0	5	5	0	2	3			
P_4	2	U	5	0	0	1			

Answer the following questions using the banker's algorithm:

(where U = (N MOD 4) + 2; T= N MOD 6 + 1; assume N = Your Roll Number)

i. Find the safe sequence if the system in a safe state?

ii. If a request from process P1 arrives for (0, 4, 0), can the request be granted immediately?

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4. (a) Consider two machines A and B of different architectures, running two different operating systems OS-A and OS-B. An application binary that has been compiled for machine A may have to be recompiled to execute correctly on machine B. Justify it. [4.5]

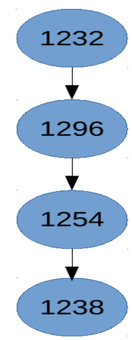
(b) Consider a simple system where the RAM can hold F (F=(Your Roll No. MOD 3) + 2) number of physical frames. The size of physical frames and logical pages is 16 bytes. The virtual addresses of the process are 6 bits in size. The program generates the following 20 virtual address references as it runs on the CPU: 0, 1, 20, 2, 20, 21, 32, 31, 0, 60, 0, 0, 16, 1, 17, 18, 32, 31, 0, 61. (Note: the 6-bit addresses are shown in decimal here.) Assume that the physical frames in RAM are initially empty. [8]

i. Translate the virtual addresses above to logical page numbers referenced by the process. That is, write down the reference string of 20 page numbers corresponding to the virtual address accesses above. Assume pages are numbered starting from 0, 1, …

ii. Calculate the number of page faults genesrated by the accesses above, assuming a FIFO page replacement algorithm.

iii. Repeat (ii) above for the LRU page replacement algorithm.

5 (a) Consider the following process tree where nodes are represented with process ID. These processes are created in the Unix platform. This figure shows the parent child relationship among the process. [4.5]



Let, after creation of all these four process, while the processes 1232 and 1296 continue with their assigned job, process 1254 terminates. At this scenario, what is the state of process 1254 after terminates? After termination of process 1254, if process 1238 gets terminated, then which process is responsible for receiving the exit status of process 1238?

(b) Describe briefly two level directory structure. What is the role of an I-node? Describe the structure of I-node in UNIX. What entries undergo changes when a file is opened to read / write / copied / renamed. [8]

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