Final Assessment Test (FAT) - APRIL/MAY 2023

Programme	B.Tech	Semester	Winter Semester 2022-23
Course Title	OPERATING SYSTEMS	Course Code	BCSE303L
Faculty Name	Prof. K Pradeep	Slot	F1+TF1
		Class Nbr	CH2022235000815
Time	3 Hours	Max. Marks	100

Section-A (8 X 10 Marks)
Answer All questions

01. SSS company is manufacturer of Smart medical diagnostic machine products. For this they want to design new customized operating system to incorporate SMART functionality specific to medical device, considering device memory is smaller compared to normal computer system. List the default functions to be supported by OS. Therefore suggest a good architecture which is suitable to build new OS and justify your answer [10]

02. Maths teacher has given you two integers to determine the highest digit in each integer and further she would like to add those two digits. Develop a C program using threads to accomplish the given task concurrently for the two numbers and return the highest digit for the two numbers and display the sum of the returned two highest digits in main(). [10]

Example:
Two numbers are a = 55687 b = 87934.
Highest digit of a = 8 and b = 9.
So the sum will be 8+9 = 17.

03. Redesign the readers-writers problem such that, writer is having higher priority than reader. A reader should start its read after two writers have completed their writing. The third writer has to wait until 5 readers have completed their reading. Use appropriate variables and write the pseudo-code or program for the above scenario using semaphores and justify your algorithm meets the properties of synchronisation. [10]

04. A process contains eight virtual pages on disk and is assigned a fixed allocation of three page frames in main memory. The following page trace occurs: 1, 0, 2, 2, 1, 7,6, 7, 0, 1, 2, 0, 3, 0, 4 Remember that all frames are initially empty and the frame size is three. Calculate page hit ratio, page miss ratio and page faults for following algorithms. [10]
i. Optimal page replacement algorithm.(4 marks)
ii. Second Chance page replacement algorithms and Comment on the efficiency of algorithms for the given frame size.(4 marks)
iii. Identify the algorithm which gives the minimum number of page faults and justify the same. [2 Marks]

05. a) Does Translation Lookaside Buffer (TLB) is used to reduce the time taken for logical to physical address translation?. Justify your answer with proper diagram.(5 Marks) [10]
b) A process P1 uses TLB for 60% of its execution remaining 40% through page table. Memory access time is 30 nano seconds and TLB access time is 20 nano seconds. Calculate the Effective Access Time of the process P1. (2 Marks)

c) Consider a logical address space of 128 pages of 1024 bytes mapped onto a physical memory of 256 frames. Calculate the number of bits required to represent logical and physical address. [3 Marks]

06. Assume that there exists 24 numbers of blocks available in the back store each of size 256 bytes. **[10]** The list of files, the starting block from where it has to be allocated, with its size details are as follows:

File Name	Start	Size in bytes
X	2	856
Y	7	512
C	11	1316
B	18	148
L	21	420

i. Illustrate with diagram the allocation of the files into the blocks specified using contiguous file allocation strategy with file allocation table. [3Marks]

ii. Illustrate with diagram the allocation of the files into the blocks using indexed file allocation strategy by considering the index block as 9 for file C.[4 Marks]

iii. Discuss the advantage and disadvantage of above mentioned file allocation strategies.(3 marks)

07. Suppose that a disk drive has 2000 cylinders, numbered 0 to 1999. The drive is currently serving **[10]** a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in order as given below

96, 1375, 973, 1797, 848, 1520, 1050, 1650, 230,110

Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests using the following disk scheduling algorithms (Consider service from left to right)?
a. SCAN b. LOOK algorithm

08. a) As a virtualization expert, briefly elaborate different approaches to operating system **[10]** virtualization. Discuss advantages and limitations. (5 marks)

b) Online shopping website X would like to host web application on your customized Operating Systems. As an expert, analyse the security threats that are possible with respect to this application and provide the suggestions to enhance the security of the same. (5 marks)

Section-B (1 X 12 Marks)
Answer All questions

09. Assume that 6 students S1, S2, ..., S6 are willing to practise basketball and the target is to place **[12]** a shoot. To complete a shoot, a student will get a maximum of three chance. First chance is based on the arrival of a student, second chance is allowed when no one is waiting for their first chance. Third chance will be given to process based on their longest waiting time for their third chance. First chance allowed for 8 time units for maximum, second chance for 16 time units. Every student enters the stadium on their own time and they take an amount of time to place a shoot. Following table shows the arrival time and required practice time of each student

① ④ ⑨ ⑩ ⑦ ⑧ ⑥ ③ ⑤ ②

1,2,3,4,5,6,7,8,9,10

Student.No	Arrival Time Clock Time(A.M)	Practice Time Time units in Minutes
1	6.00	3
2	6.10	25
3	6.30	30
4	6.40	10
5	6.45	35
6	6.50	40

Illustrate with required diagram, identify the time at which each student has completed their practice and the time they have taken to wait for their turn to play. (12 Marks)

Section -C (1 X 8 Marks)
Answer All questions

16. Four different groups of family want to go trip on same time. All four groups require different [8] set of vehicles to accomadate all their family members. They approached ABC travel agency for their arrangements. The travel agency has the following number of three different types of luxurious cars. (8 Marks)

Car Type A=10; Car Type B=8; Car Type C=11.

The maximum requirements of different types of cars and the allotted cars for varius groups are as follows:

	Max Cars Required			Alloted Cars		
	A	B	C	A	B	C
G1	8	6	8	4	2	3
G2	4	3	6	1	1	3
G3	7	7	4	2	3	2
G4	6	4	5	1	1	1

The travel agency wanted to work out the schedule plan to find the possibility of allotting available vehicle based on their trip plan. Initially travel agency allotted some cars to various groups to plan their schedule. Provide a solution to the travel agency to find a schedule plan. Will that travel agency satisfied all 4 groups requirement? If not, how travel agency can solve this issue. Illustrate your solution in detail for this scenario

〰〰〰〰