Bachelor of Computer Science & Engg. Examination, 2021
(3rd year, 1st semester)

OPERATING SYSTEM

Time: 5 hours
[The time includes downloading of question paper and scanning of handwritten answerscript and uploading of scanned answerscript]

Full Marks: 100 [Part A: 30 and Part B: 70]

Part A (Total Marks: 30) [CO3]

Answer Question No. 1 OR Question no. 2.

1.   a) Consider the following page reference during a given time interval for a memory consisting of 4 frames : 25,36,17,78,89,25,36,17,11,22,25,36,17,1,2,78,89,11,22,25. Find the hit ratio using both (i) First In First Out page replacement strategy and (ii) Least Recently Used page replacement strategy. Show the final contents of memory in each case. Compare the results and comment and justify your comments.

b) What are the differences between Paging and Segmentation?

c) What is *internal fragmentation*?   (15+4+3)+(5+3)=30

2. a) Consider the following page reference during a given time interval: 25,36,17,78,89,25,36,17,11,22,25,36,17,1,2,78,89,11,22,25. Find the hit ratio using First In First Out page replacement strategy for a memory consisting of (i) 5 and (ii) 6 frames. Show the final contents of memory in each case. Compare the results and comment and justify your comments.

b) What is Translation Lookaside Buffer (TLB)? What is the Effective Access time for the situation with 95% hit ratio, TLB search time 20 ns and memory access time 125ns?

c) What is *external fragmentation*?   (15+4+3)+(5+3)=30

Part B (Total Marks: 70)

Group B1 [CO2: 30]

Answer Question No. 3 OR Question no. 4.

3. a) Explain the necessary and sufficient conditions for deadlock. How can deadlock be prevented by not allowing the "*hold and wait*" condition? What are the associated problems?

b) Consider the following system with 4 processes. Find the *waiting time* of each process using (i) Shortest Remaining Time Next strategy and (ii) Round Robin with 4 time units as time quantum. Provide a comparative analysis of the above mentioned strategies based on the results. Mention the shortcomings of both strategies.

Continued from Page 1: (Q 3b)

Process	Arrival time	Execution Time
A	0	12
B	2	8
C	6	18
D	10	10

c) Explain *race condition* with the help of an example.   (6+4+3)+(8+4)+5=30

4. a) Consider the following system with 4 processes. Find the *turnaround time* of each process using Shortest Job First/Next strategy (SJF/SJN). Show the corresponding Gantt Chart. Mention the disadvantages of SJF/SJN.

Process	Arrival time	Execution Time
A	0	12
B	2	8
C	6	18
D	10	10

b) Consider the following snapshot of 4 resources (R1, R2, R3, R4) in a system with 5 processes; P_0, P_1, P_2, P_3, P_4.

	Allocated				Maximum Requirement				No. of Maximum resources			
	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4
P_0	2	1	0	2	3	2	0	4	8	6	7	8
P_1	0	2	1	3	2	3	3	5				
P_2	1	1	2	1	4	3	5	2				
P_3	2	2	2	2	2	5	4	3				
P_4	3	0	2	2	4	0	4	5				

(i)   What are the further requirements of each of the processes?
(ii) Find out whether the system is in *safe* state or not. Show the working of the algorithm/s. What is the safe sequence of processes, if any, in this case?
(iii) Suppose there is request from P_3 for 2 more instances of R2 and 2 more instances of R3. Show whether this request could be granted.   (4+2+2)+(4+12+6)=30

Group B2 (Total Marks: 20) [CO4]

Answer Question No. 5 OR Question no. 6.

5. a) How does *indexed file allocation* work? What are its demerits?
   b) Disk requests come into the disk driver for cylinders 5, 29, 11, 91, 38, 14, 24, 19, 82, 41, 27, 78, 56, 97, 33 in that order. A seek takes 2.5 msec per cylinder move. What is the total seek time to access all blocks for the following disk scheduling policies: (i) SCAN and (ii) C-SCAN (for both cases consider disk arm to be initially at cylinder 17 and moving towards cylinder 99). Assume the disk arm flies back to cylinder 0 at a rate of 1.5 msec per cylinder. Compare the seek times and comment.   8+(8+4)=20

6. a) How does *linked file allocation* strategy work?
   b) What is the *Bit Vector or Bit Map* free space management technique? What are its disadvantages?
   c) Disk requests come into the disk driver for cylinders 5, 29, 11, 91, 38, 14, 24, 19, 82, 41, 27, 78, 56, 97, 33 in that order. A seek takes 2 msec per cylinder move. What is the total seek time to access all blocks for the First Come First Served (FCFS) disk scheduling policy. Initially the disk arm is at cylinder 11. What are the disadvantages of the FCFS disk scheduling algorithm?

$$6+4+(6+4)=20$$

Group B3 (Total Marks: 5+10+5=20) [CO1, CO5, CO6]

Answer Question No. 7 OR Question no. 8.

7. a) How do you like to describe the working of an operating system?
   b) What are the different implementation methods of Access Matrix? Briefly describe any one. What is *Symmetric key encryption*?
   c) What is the concept of segmentation with paging in Intel architecture?

$$5+(3+4+3)+5=20$$

8. a) What are the *resources* of a computer system?
   b) What does *Access Matrix* contain? How is Asymmetric key Encryption performed? You may take the help of an example.
   c) How is a process created and represented in Linux?

$$5+(3+7)+5=20$$

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Instructions for submission of answerscript:

1. Please scan your handwritten answerscript.
2. Mail the scanned answerscript to: sarmisthasn1010@gmail.com
3. Please put the subject line as: BCSE III OS SemI 2021 <Roll No.>
4. Insert your full Roll number in <Roll No.>