B. E. Computer Science & Engineering

THIRD YEAR, FIRST SEMESTER EXAMINATION 2019

OPERATING SYSTEM

Time: 3 hours Full Marks: 100

Group A (Total Marks: 30) [CO2]

Answer Question No. 1 OR Question no. 2. Question no. 3 is COMPULSORY.

1. a) Consider the following page reference during a given time interval for a memory consisting of 4 frames : 5,6,7,8,9,5,6,7,1,2,5,6,7,1,2,8,9,1,2,5. Find the hit ratio using both (i) First In First Out page replacement strategy and (ii) Least Recently Used page replacement strategy. Show the contents of memory. Comment on the results and justify your comments.
   b) What is *thrashing*? Which situation leads to thrashing? What is the effect of *thrashing*?
   c) How does *Buddy System Allocator* work? (10+3)+(2+2+2)+3=22

2. a) Consider the following page reference during a given time interval: 3,2,1,0,3,2,4,3,2,1,0,4,2,3,2,1,0,4. Find the hit ratio using First In First Out page replacement strategy for a memory consisting of (i) 3 and (ii) 4 frames. Show the contents of memory. Comment on the results and justify your comments.
   b) What is *locality model*? Explain the *Working-Set Model.* (10+3)+(3+6)=22

3. Answer ANY TWO questions: 4+4=8
   a)When are logical addresses and physical addresses same? When are they different?
   b) What is *external fragmentation*? When does it occur?
   c) Do you think *degree of multiprogramming* is limited in Partitioned memory allocation (fixed sized partition and variable sized partition) strategy? Justify your answer.
   d) Give an example of Two-level paging. In what situation will it be required?

Group B (Total Marks: 30) [CO3]

Answer Question No. 4 OR Question no. 5. Question no. 6 is COMPULSORY.

4. a) Each process P_i, i = 1,2,3,.....,9 is coded as follows with mutex initialized to 1:
== while true { P(mutex); [critical section]; V(mutex);} ==
Code for P_{10}: == while true { V(mutex); [critical section]; V(mutex);} ==
How many number of processes (at most) can be in critical section at any moment? Give reasons for your answer.

b) Consider the following system with 4 processes. Find the *waiting time* of each process using (i) Shortest Remaining Time Next strategy and (ii) First Come First Served strategy. Provide a comparative analysis of the above mentioned strategies based on the results.

Process	Arrival time	Execution Time
A	0	7
B	3	3
C	5	4
D	7	5

c) What parameters of a process (to be aborted) may be consdered during recovery from deadlock? 4+(8+3)+3=18

5. a) What is the concept of *Mulitilevel Feedback Queue* scheduling strategy? What is *aging*?
b) Consider the following system with 4 processes. Find the *turnaround time* of each process using Shortest Job Next strategy. Mention its disadvantages.

Process	Arrival time	Execution Time
A	0	5
B	3	5
C	5	4
D	7	5

c) The following system with 4 processes and one type of resource is currently in *unsafe* state. Choose any one necessary condition for deadlock that can be prevented (at this point in time) to ensure smooth running of the system. Please provide appropriate reasons for your choice and mention the problems that this measure may come with. There are 18 nos of the resource in the system.

Process	Maximum requirement	Currently holding
A	10	7
B	6	3
C	5	2
D	7	4

d) The following program snippet consists of three concurrent processes and three binary semaphores initialized as: s0=1, s1=0, s2=0

Process P_0: == while true { P(s0); print 'hi'; V(s1); V(s2);}==
Process P_1: == P(s1); V(s0);} ==
Process P_0: == P(s2); V(s0);} ==
How many times (at most) will P_0 print 'hi'? (3+2)+(4+2)+4+3=18

6. Answer ANY THREE questions: 3X4=12

a) Explain *race condition* with the help of an example.
b) What does Process Control Block (PCB) contain?
c) Briefly explain the necessary conditions for deadlock to occur in a system.
d) Give a brief overview of the requiremnets for solution to Critical-Section problem.
e) Discuss briefly any one multithreading model.
f) Compare between *process* and *thread*.

Group C (Total Marks: 20) [CO4]

Answer Question No. 7 OR Question no. 8.

7. a) Explain *linked file allocation* strategy with relative merits and demerits.
   b) What is *seek time*?
   c) Disk requests come into the disk driver for cylinders 151, 223, 128, 109, 238, 142, 243 in that order. A seek takes 2 msec per cylinder move. What is the total seek time to access all blocks for the following disk scheduling policies: (i) Shortest Seek Time First and (ii) C-SCAN (initially moving up from cylinder 0 towards cylinder 299). In all cases disk arm is initially at cylinder 117. Assume the disk arm flies back to cylinder 0 at a rate of 1.5 msec per cylinder. Compare the seek times and comment. 6+2+(8+4)=20

8. a) How does *contiguous file allocation* strategy work? What are the advantages and disadvantages of *contiguous file allocation* strategy?
   b) Compare between the *Grouping* and *Counting* free space management techniques.
   d) Disk requests come into the disk driver for cylinders 151, 223, 128, 109, 238, 142, 243 in that order. A seek takes 2 msec per cylinder move. What is the total seek time to access all blocks for the SCAN disk scheduling policy. Initially the disk arm is at cylinder 117. What are the disadvantages of the SCAN disk scheduling algorithm?
   c) What is *rotational latency*? 6+6+(4+2)+2=20

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

Answer Question No. 9 OR Question no.10.

9. a) Do you consider user interface to be an essential component of OS. Why or why not?
   b) What are the different threats? What is *Public key encryption*? Construct the *capability list* using the following information: <Domain, Object, right-set> as given below: {D1,O1, read & execute}, {D1, O3, execute}, {D1, D2, switch}, {D2,O1, write}, {D2, O2, write & execute}, {D2, O4, execute}, {D2, D1, switch}, {D3,O2, execute}, {D3, O3, write}, {D3, D2, switch}
   c) What are the contents of *disk inode* in Unix? 5+(3+3+4)+5=20

10. a) What are meant by *resources* of a computer system? What is *system call*?
    b) What is *Symmetric key encryption*? What does *Access Matrix* contain? How can it be implemented?
    c) What is the *File system layout* in Unix? 5+(3+2+5)+5=20

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