Bachelor of Computer Science & Engg. 3rd year 2nd Sem. Exam 2016

OPERATING SYSTEMS

Time: 3 hours Full Marks: 100

Answer Question no.1 and any **three (3)** from the rest

(All parts of the same question must be answered together)

1.

a. How does *working set strategy* help in preventing *thrashing*? Is it possible for a process to have one working set representing data and another working set representing code? Explain.

b. What is *spooling*?

c. What is *seek time*? Why is it considered to be a parameter in disk scheduling?

d. What is protection domain? Can there be dynamic association in a domain? Justify.

e. In which page replacement strategy Belady's anomaly may be observed? Why?

f. Suppose there are n (>1) concurrent processes. P_i will execute its code C_i at some point of time. The requirement is that the codes be executed in sequence: C_n, C_{n-1}, .., C_2, C_1. How could this be synchronized using semaphores? How many semaphores will be needed and why?

g. Distinguish between Multilevel Queue and Multilevel Feedback Queue scheduling.

h. Does the characteristics of *swap space* in *raw partition* help in improving performance? Justify your answer.

4+2+3+3+3+4+3+3

2.

a. What is response time? What is turnaround time?

Consider a system with five processes as shown below with corresponding arrival time and execution time:

Process	Arrival time	Execution time (msec)
P_0	0	3
P_1	2	8
P_2	5	6
P_3	7	2
P_4	9	5

Calculate waiting time and turnaround time of each process using Round Robin scheduling policy with 2 msec time slice. Show the scheduling decisions using Gantt chart. Mention any assumption/s that you take.

b. What are the implementation difficulties of Shortest Remaining Time Next (SRTN) scheduling? What is the disadvantage of *Priority* scheduling? How can it be mitigated?

Q2 contd.

c. What are the contents of a Process Control Block (PCB)?

d. Under what circumstances may a process be *suspended*? Which processes are generally suspended? What happens to the process then? How does it *execute* again?

(3+5)+(2+3)+4+8

3.

a. Consider the following memory reference string for (i) 3 frame and (ii) 5 frame memory: 17 10 11 12 10 13 10 14 12 13 11 10 13. Using (i) First In first Out (FIFO) and (ii) Least Recently Used (LRU) page replacement strategies, find the hit ratio in both cases. Show all possible steps. Comment on the findings.

b. What are the implementational advantages and disadvantages of *segmentation memory management* scheme with respect to *paging memory management* scheme?

c. How is *hashed page table* implemented? When is such a table required?

d. How is kernel memory allocated using *slab allocation technique*?

e. Why is *worst fit* strategy sometimes considered to provide better performance than *best fit* strategy?

12+4+3+4+2

4.

a. Consider a system providing support for both types of threads with *One-to-One* mapping model. Does a multithreaded process in this system consist of (i) a working set for the entire process or (ii) a working set for each thread? Justify your answer. What are the advantages and disadvantages of *Many-to-Many* mapping model?

b. How does *starvation* differ from *deadlock*?

c. Consider the current *Allocation matrix* for 4 processes with 2 types of resources:

P1: 1, 3; P2: 4, 1; P3:1, 2 and P4: 2, 0
and the current *Request matrix*: P1: 1, 2; P2: 4, 3; P3: 1, 7 and P4: 5, 1
with *Availability Vector* as: 1, 4

The resources are with processes and as mentioned in the *Availability Vector*.

Find out the state of the system and show the steps you take to arrive at your answer.

d. Explain the requirements for solutions to the critical section problem.

e. What is the *No preemption* condition? How can *Hold and Wait* condition be prevented? What are its pitfalls?

6+3+5+6+5

5.

a. What information are contained in *file system*? How are information of open files kept?

Q5 contd.

b. Compare *Indexed* File Allocation strategy with *Linked* File Allocation strategy. Suppose there is *U* GB space available for keeping user files in a disk with block size *B* KB. Each block requires *P* bytes to denote its address. Give an indication of the size of the *largest* file that can be stored in this disk using (i) *Indexed* File Allocation strategy and (ii) *Linked* File Allocation strategy?

c. How does SCAN disk scheduling technique work? Compare SCAN with CSCAN.

d. Disk requests come into the disk driver for cylinders in the following order: 132, 249, 351, 21, 89, 175, 442, 95, 187, 212. A seek takes 2 msec per cylinder move. What is the total seek time to access the above requests for (i) First Come First Served (FCFS) and (ii) Shortest Seek Time First (SSTF) disk scheduling strategy? Disk arm is initially at cylinder 250. Commnet on the results.

e. What is *RAID?* What issues do they address?

3+(4+3)+5+6+4

6.

a. How does the *signal* operation differ in case of *monitor* and *semaphore*?

b. How can *logical* and *physical* addresses be related? What is meant by *virtual memory*?

c. Explain the concept of *Capability*. What is *Capability List*?

d. What is the content of Access Control Matrix? Suppose a right is copied from Access Control Matrix entry *access(i,j)* to another entry *access(p,j)* and then removed from *access(i,j)*. What is this operation known as? What does *access(p,k)* with *control* right signify?

e. What is *race condition*? Explain with the help of a suitable example.

f. Do you think kernel memory allocation techniques should be different from user memory allocation techniques? Why or why not? What is *Buddy system*? What is considered to ba a drawback of *Buddy system*?

3+4+4+5+4+5

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