Bachelor of Computer Science & Engg. Examination, 2011

(3rd year, 2nd semester)

OPERATING SYSTEMS

Time: 3 hours   Full Marks: 100

Answer Question no.1 and any **four** from the rest

1.

a. What is seek time?

b. What is *race condition*?

c. Mention the condition under which the following transition would occur in a process state
diagram: (i) Ready to Run   (ii) Run to Blocked/Wait

d. For which type of file access would you find Linked file allocation strategy to work easily
and why?

e. List of processes waiting on a semaphore are often implemented as queues, and when a signal
V() occurs, the first process in the queue is woken up. What would happen if such a waiting
list is implemented as a stack instead of a queue?

f. What is Belady's anomaly?

g. What is inverted page table? How is it searched?

2+2+3+3+3+3+(2+2)

2.

a. What was the problem with the classical definition of wait() or P() and signal() or V()? How
could it be avoided?

b. What is waiting 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
P$_0$	0	6
P$_1$	2	3
P$_2$	3	2
P$_3$	5	4
P$_4$	6	2

Calculate waiting time and turnaround time of each process assuming Shortest Remaining
Time Next (SRTN) scheduling policy. Show the scheduling decisions using Gantt chart.

(3+4)+(2+2+6+3)

3.

a. Consider the following page reference during a given time interval for a memory consisting of 3 frames : 7, 9, 8, 0, 1, 8, 9, 7, 9, 8   Using i) First In First Out (FIFO) page replacement strategy and ii) Least Recently Used (LRU) page replacement strategy.

Show the contents of memory each time a page is referenced.

Compare the number of page hits for both strategies. Hence comment on their respective performances.

b. What does Translation Look-aside Buffer (TLB) contain? If it had not been used, what would be the problem, if any?

c. Explain the concept and working of segmentation. What advantages are achieved if paging is combined with segmentation?

10+4+6

4.

a. Explain why deadlock cannot always be prevented by denying the mutual exclusion condition.

b. Consider the following snapshot of 3 resources (R1, R2, R3) of a system with 5 processes; P_0, P_1, P_2, P_3, P_4. There are 10 instances of R1, 5 instances of R2 and 7 instances of R3.

	Allocated R1 R2 R3	Maximum Requirement R1 R2 R3	Available R1 R2 R3
P_0	0 1 0	7 5 3	3 3 2
P_1	2 0 0	3 2 2	
P_2	3 0 2	9 0 2	
P_3	2 1 1	2 2 2	
P_4	0 0 2	4 3 3	

(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 in this case?

(iii) Suppose there is request from P_1 for 1 more instance of R1 and 2 more instances of R3. Show whether this request could be granted.

2+(3+9+6)

5.

a. What is rotational latency?

b. Compare and contrast Linked File allocation strategy with Indexed File allocation strategy.

c. What information is shared between two threads of same process? What information is local to a thread only? What are the different models of threading?

d. Consider a logical address space of 128 pages of 1024 words each, mapped onto a physical memory of 32 frames. (i) How many bits are there in the physical address? (ii) How many bits are there in the logical address?

2+6+(2+2+4)+2X2

6.

a. Disk requests come into the disk driver for cylinders 37, 29, 56, 12, 84, 77, 48, 19 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 (SSTF) and (ii) SCAN (disk arm moving from cylinder 0 towards cylinder 199). In all cases disk arm is initially at cylinder 43.

b. What are the demerits of SCAN disk scheduling algorithm? What are the advantages and disadvantages of First-Come-First-Serve disk scheduling algorithm?

c. What are the problems with contiguous file allocation strategy?

(5X2)+(3+4)+3

7.

a. What problems may be faced if the code snippets of processes requesting usage of critical section, are as follows:

(i) Process P_0 (ii) Process P_1
     ----   ----
     signal (mutex);   wait (mutex);
     ---   ----
     critical section   critical section
     ---   ----
     wait (mutex);   wait (mutex);
     ---   ---

Consider the above situations (i and ii) to be separate. Give reasons for your answer.

b. What are the advantages and disadvantages of static variable-size partitioned memory management technique? What is the difference between static variable-size partitioned memory management and static equal-size partitioned memory management?

c. In dynamic partitioned memory management, what strategies are used to allocate memory space to an incoming program? Briefly explain each of them. Which one among these is considered to be the best possible technique by you? Justify.

6+(4+2)+8

8.

a. What does an Access Matrix contain? What is the problem with Global Table?

b. How could Access Matrix be effectively implemented?

c. What are the characteristics of Monitor?

d. How does working-set strategy prevent thrashing?

(2+2)+6+4+6