Bachelor of Engineering in Computer Science & Engg. Examination 2014
(3rd year 2nd Semester)

OPERATING SYSTEMS

Time: 3 hours Full Marks: 100

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

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

1.

a. What is race condition? Explain with a suitable example.

b. What are the consequences if the list of processes waiting for a device is implemented as stack?

c. Compare the performance (with proper justification) of SCAN and Shortest Seek Time First scheduling, assuming concentration of requests in inner tracks of the cylinder and requests arriving at random.

d. Propose and explain a method for implementing general semaphore using binary semaphore.

e. What is Capability list? Why is it so called?

f. Explain the concept of working set strategy.

3+3+3+4+3+4

2.

a. What actions are taken when a process is created?

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

Process	Arrival time	Execution time
P_0	0	7
P_1	2	4
P_2	6	6
P_3	9	5

Calculate waiting time and turnaround time of each process using Round Robin (RR) scheduling policy with CPU time slice 4 units. Show the scheduling decisions using Gantt chart. Mention any assumption that you take. How will RR behave if the CPU time slice is considerably large? What are the advantages of using RR?

b. Is Shortest Job First (SJF) scheduling preemptive? Give reasons for your answer. What are the disadvantages of Shortest Remaining Time Next (SRTN) scheduling?

(2+8+2+2)+6

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, 9, 8, 1, 0, 1. Using both First In First Out (FIFO) and Least Recently Used (LRU) page replacement strategies show the contents of memory each time a page is referenced. Compare the number of page hits for both cases. Do you get a result that you expect? Why or why not?

b. What is the difference between external and internal fragmentation? What is memory compaction? What does Translation Look aside Buffer (TLB) hold? What does an executable file contain?

10+10

4.

a. What are the attributes of a file? What operations can be performed on file? Can the same operations be performed on directory? Name any one additional operation that can be performed on directory.

b. Compare Indexed File Allocation strategy with Linked File Allocation strategy. Consider a file system using inodes for file representation. Disk blocks are 8KB and a pointer to a block requires 4 bytes. The inode contains 10 direct blocks, and a single and a double indirect disk blocks. What is the maximum size of a file supported by this file system?

c. What is bit-vector presentation of free disk space management? What are its problems?

d. What are the contents of in-core inode in Unix? Why is it different from that of the disk inode?

5+(4+3)+3+5

5.

a. What parameters are considered for disk scheduling? Explain each of these.

b. Disk requests come into the disk driver for cylinders 13, 29, 135, 121, 94, 37, 184, 197, 57, 112 in that order. A seek takes 2 msec per cylinder move. What is the total seek time to access the above requests for Shortest Seek Time First (SSTF) disk scheduling strategy? Disk arm is initially at cylinder 50. Do you think Circular SCAN disk scheduling strategy may work better than SCAN under some particular disk request pattern? Justify your answer.

c. What do you understand by swap space management? What does boot block contain? If a disk contains more than one file systems, will there be a boot block for each? What will each such boot block contain?

6+8+6

6.

a. Explain the requirements for solutions to the critical section problem. How can *Hold and Wait* condition be prevented? What are its pitfalls?

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				Available			
	R1	R2	R3	R4	R1	R2	R3	R4	R1	R2	R3	R4
P_0	2	1	0	2	3	2	0	4	5	6	5	6
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.

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

7.

a. What information is local to a thread only? What is Many-to-Many threading model? What are its advantages and disadvantages? What are the different approaches to thread scheduling? Explain any one of them with an appropriate example.

b. What are the drawbacks of semaphore? How does monitor support synchronization?

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