Bachelor of Engineering in Computer Science & Engg. Examination 2015
(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. Is Shortest Remaining Time Next (SRTN) algorithm preemptive? What are its disadvantages?

b. Compare the performance (with proper justification) of SCAN and CSCAN disk scheduling, assuming requests are spread evenly in the tracks and arriving at random.

c. Consider two processes P_j and P_k and the following snippet of code of process P_k:

```
int turn; boolean flag[2];
do {    flag[k] = TRUE; turn = j;
        while (flag[j] && turn == j);
                critical section;
        flag[k] = FALSE;
                remainder section;
    } while (TRUE)
```

Do P_j and P_k satisfy the *Progress* and *Bounded waiting* conditions for solution to mutual exclusion problem? Justify.

d. What is internal fragmentation? When will it occur? What are its problems?

e. Why can or cannot deadlocks be prevented by denying the *mutual exclusion* condition?

3+4+7+4+2

2.

a. Consider the following page reference during a given time interval for a memory consisting of 5 frames : 1, 2, 5, 2, 6, 5, 7, 1, 6, 1, 7, 8, 1, 2, 6. 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 and comment.

b. Compare between First fit and Worst fit memory allocation strategies.

c. How is *Inverted page table* organized? What are its problems?

d. How can segment be shared among processes? Suggest a possible implementation and justify.

8+4+4+4

3.

a. What are the advantages and disadvantages of Indexed file allocation strategy? What are the problems with Contiguous file allocation strategy? Which space management technique for disk is suitable for Contiguous file allocation and why?

b. How does Unix handle file allocation?

c. Is it possible to know the number of the processes that are waiting on a semaphore? Explain.

d. What is the *effective access* time in Demand paging environment?

(4+3+3)+4+3+3

4.

a. State *No preemption* and *Circular Wait* conditions of deadlock.

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	3	0	2	1	3	2	2	3	5	5	5	5
P_1	0	1	2	1	2	3	4	2				
P_2	2	2	2	2	5	4	3	2				
P_3	1	2	3	2	2	4	5	4				
P_4	2	3	1	1	4	4	4	4				

(i) What are the further requirements of each process?

(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_2 for 2 more instances of R1 and 2 more instances of R2. Show whether this request could be granted. State the algorithm used.

4+(2+8+6)

5.

a. Are there any differences between semaphore and monitor? Explain.

b. What is Rotational Latency? How does it affect disk access time?

c. Disk requests come into the disk driver for cylinders (0-299): 113, 219, 35, 211, 145, 117, 46, 79, 157, 12, in that order. A seek takes 2.5 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 strategies? Disk arm is initially at cylinder 123. Comment on the results.

d. What is the *Hold and Wait* condition? How can it be prevented? What are the associated problems?

4+4+6+6

6.

a. What *Memory management information* and *Accounting information* are held in Process Control Block (PCB)? When will each of the following transition take place: (i) Running state to Ready state, (ii) Waiting state to Ready state

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

Process	Arrival time	Execution time
P_0	0	8
P_1	5	6
P_2	7	4
P_3	9	5
P_4	11	3

Calculate waiting time and turnaround time of each process using Shortest Job First (SJF) scheduling policy. Show the scheduling decisions using Gantt chart. Mention any assumption that you take.

c. What is *aging*? Can it be used in Multilevel Feedback Queue Scheduling technique? How?

(4+4)+7+5

7.

a. What does a thread share with its parent? Why is thread generally called "lightweight" process? What is the Two-level threading model?

b. What is a domain? What does Access matrix represent? What are its possible implementations?

c. Differentiate between Symmetric key cryptography and Asymmetric key cryptography.

8+8+4

8.

a. What are the desirable features of real-time operating system?

b. What information (about a real-time process) should be known?

c. What are the pros and cons of allowing preemption in real-time scheduling?

d. Why may you find it easier to schedule periodic tasks with respect to aperiodic tasks?

4X5