OPERATING SYSTEMS
(CSEN 3103)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) System calls are usually invoked by
(a) software interrupt (b) indirect jump
(c) polling (d) privileged instruction.

(ii) A thread is a
(a) Task (b) Process (c) Program (d) Light Weight Process.

(iii) Banker's algorithm does which of the following
(a) Deadlock avoidance (b) context switching
(c) Memory scanning (d) none of the above.

(iv) Scheduling algorithm that is inherently pre-emptive is
(a) FCFS (b) RR (c) SJF (d) none of them.

(v) Page fault occurs when
(a) page is corrupted by application software
(b) page is not in the memory
(c) page is in cache
(d) one tries to divide a number by zero.

(vi) A shell is
(a) a hardware component (b) command interpreter
(c) a part of compiler (d) a tool in CPU scheduling.

(vii) A benefit of microkernel organization is
(a) extensibility (b) portability (c) flexibility (d) all of these.

(viii) If a process is executing in its critical section, then no other processes can be executing in their critical section. This condition is called
(a) mutual exclusion (b) critical inclusion
(c) synchronous inclusion (d) asynchronous end.

(ix) Semaphore is a _____ to solve the critical section problem.
(a) hardware for a system (b) special program for a system
(c) special type of integer (d) none of these.

(x) The two atomic operations permissible on semaphores are: (choose two)
(a) wait (b) stop (c) hold (d) signal.

Group – B

2. (a) What is an Operating System? What are the functions of operating system?

(b) What is a process? With the help of a transition diagram explain various states of a process.

(2 + 4) + (2 + 4) = 12

3. (a) What is a thread? What is the difference between a thread and a process?

(b) Describe microkernel organization.

(3 + 3) + 6 = 12

Group – C

4. (a) What is priority scheduling? Can SJF be considered as priority scheduling?

(b) Write down the four necessary conditions of deadlock. Distinguish between "starvation" and "deadlock**".**

(5 + 1) + (4 + 2) = 12

5. (a) Given memory partitions of 100 K, 500 K, 200 K, 300 K and 600 K (in order). How would each of the first-fit, best-fit and worst-fit algorithms place processes of size 212 K, 417 K, 112 K and 426 K (in order)?

(b) What is a semaphore? Describe the operations on semaphore.

5 + (1 + 6) = 12

Group – D

6. (a) Assuming the current disk cylinder is 50 and the request is for cylinders 1, 36, 49, 65, 53, 12, 3, 20, 55, 16, 78 . Find the sequence of servicing using shortest seek time first (SSTF) algorithm. Total number of cylinders in the system is 90. Calculate the average cylinder movement.

(b) Differentiate between paging and segmentation.

5 + 7 = 12

7. (a) Describe the operation of DMA.

(b) What is memory mapped I/O? What is I-O mapped I/O? How are the two different from each other?

6 + (3 + 3) = 12

Group – E

8. (a) What is shoulder surfing and password sniffing? Describe operation of onetime password used for user authentication in enforcing security of computer system. Highlight how OTP protects against shoulder surfing and password sniffing.

   (b) What is a virus? What is a worm?

(2 + 4) + (3 + 3) = 12

9. (a) Differentiate between bad block and boot block.

   (b) Consider the following reference string. Calculate the page fault rate using FIFO algorithm:
   1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 5, 4, 2
   Assume that the memory size is 4 frames.

(3 + 3) + 6 = 12

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