FUNDAMENTALS OF OPERATING SYSTEMS
(CSEN 4181)

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

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> 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)   Which scheduling algorithm is inherently pre-emptive?
             (a) FCFS   (b) SJF
             (c) RR   (d) Priority Scheduling.

    (ii)   In which of the following case Banker's algorithm is used?
             (a) Deadlock Avoidance   (b) Context Switching
             (c) Deadlock Recovery   (d) Mutual Exclusion.

    (iii)   Thread is referred to as
             (a) lightweight process   (b) files
             (c) program   (d) set of processes.

    (iv)   A benefit of the microkernel organization is:
             (a) Portability   (b) Flexibility
             (c) Extensibility   (d) All of these.

    (v)   Usually page size and frame size
             (a) is equal   (b) is not equal
             (c) page size > frame size   (d) frame size > page size.

    (vi)   Equal partition in memory allocation can lead to
             (a) External fragmentation   (b) Internal fragmentation
             (c) Both (a) and (b)   (d) None of these.

    (vii)   Address generated by CPU is generally referred to as
             (a) Logical   (b) Relational
             (c) Virtual   (d) Physical.

    (viii)   A solution to the problem of external fragmentation is:
             (a) compaction   (b) larger memory space
             (c) smaller memory space   (d) None of these.

(ix)   Processes which are ready and waiting to execute are kept on a list called
(a) ready queue   (b) waiting queue
(c) suspended queue   (d) none of these.

(x)   The scheduler which selects process from ready queue and loads them to the CPU is called
(a) short term scheduler   (b) middle term scheduler
(c) long term scheduler   (d) none of these

Group – B

2. (a) What is microkernel architecture of operating system? What are its benefits? (Remember/LOCQ)
   (b) What are the various functions of a general purpose operating system? (Remember/LOCQ)

   4 + 8 = 12

3. (a) Compare microkernel system with layered operating system. (Analyze/HOCQ)
   (b) What is system call? What are various types of system calls? (Remember/LOCQ)

   (4 + 4) + (1 + 3) = 12

Group – C

4. (a) What is the difference between pre-emptive scheduling and non-pre-emptive? (Analyze/HOCQ)
   (b) Consider the following snapshot of a system: (Understand/IOCQ)

	Allocation	Max	Available
	A B C D	A B C D	A B C D
P0	0 0 1 2	0 0 1 2	1 5 2 0
P1	1 0 0 0	1 7 5 0	
P2	1 3 5 4	2 3 5 6	
P3	0 6 3 2	0 6 5 2	
P4	0 0 1 4	0 6 5 6	

   Answer the following questions using Banker's algorithm
   (i) What is the content of the need matrix?
   (ii) Is the system in a safe state?
   (iii) If a request from process p1 arrives for (0, 4, 2, 0), can the request be granted immediately?

   6 + 6 = 12

5. (a) When is inter-process communication (IPC) needed? Describe the two basic operations of semaphore. (Understand/IOCQ)
   (b) What is the difference between an user level thread (ULT) and a kernel level thread (KLT). What are the advantage and disadvantage of ULT? (Understand/IOCQ)

   4 + 8 = 12

Group – D

6. (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)? (Understand/IOCQ) Which algorithm makes the most efficient use of memory? (Understand/IOCQ)
   (b) Consider the following reference string. Calculate the page fault rate for the 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. (Understand/IOCQ)

   (6 + 2) + 4 = 12

7. (a) A disc queue has the following requests to read cylinders-87,170,40,150,36,72,66,15. Disk read-write head is initially at cylinder 60. What is the average head movement using SSTF algorithm? (Understand/IOCQ)
   (b) Differentiate is boot block and bad block. (Analyze/HOCQ)

   8 + 4 = 12

Group – E

8. (a) Describe an access control matrix and how is it used in protection of a computer system? (Remember/LOCQ)
   (b) Explain 4 levels of security measurement to protect a system. (Remember/LOCQ)

   4 + 8 = 12

9. (a) What are the goals of protection? (Remember/LOCQ)
   (b) For each of the following security attacks say if public key encryption can help prevent the attack. Justify your answer. (Analyze/HOCQ)
      (i) Spoiler/Denial of Services
      (ii) Abuse of valid privileges
      (iii) Listener or eavesdropper attack
      (iv) Trojan Horse
      (v) Buffer overflow attack.

   7 + 5 = 12

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Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	36.5%	39.5%	24.0%

Course Outcome (CO):
After the completion of the course students will be able to
1. Apply knowledge of mathematics, science and engineering in the areas of process management, memory management and storage management.
2. Understand the underlying technologies and features of memory management and storage management.
3. Understand the various design issues in process management..

4. Learn operating system operation, structures.
5. Be familiar with various types of operating systems.
6. Identify the concepts learned here which are used in their own field of work

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question

Department & Section	Submission link:
ECE	https://classroom.google.com/c/NDY1MTY4MTg1NTQ1/a/NDY1MjAzNjA3NzYw/details