KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Marks Scored:

Level : B. E. / B. Sc.
Year : III

Course : COMP 307
Semester : I

Exam. Roll No.:

Time: 30 mins.

F.M. : 10

Registration No.:

Date FEB 2 7 2019

SECTION "A"
[20 Q.× 0.5 = 10 marks]

Circle the most appropriate answer.

1. In which operating system, the response time is very crucial?
   A. Multi-processing OS
   B. Batch OS
   C. Real-time OS
   D. Smartcard OS

2. Which of the following is **not** true?
   A. Kernel is the program that constitutes the central core of the operating system.
   B. Kernel is made of various modules which cannot be loaded in running operating system.
   C. Kernel is the first part of operating system to load into memory during booting.
   D. Kernel remains in the memory during the entire computer session.

3. Real time systems are
   A. Primarily used in mainframe computers
   B. Used for program development
   C. Used for real time interactive users
   D. Used for monitoring events as they occur

4. A semaphore
   A. is a binary mutex
   B. must be accessed from only one process
   C. can be accessed from multiple processes
   D. is used to improve system performance

Process	Priority	Arrival time	Burst time
P1	2	0	5
P2	1	2	4
P3	3	3	7
P4	4	5	6

Table 1

5. Consider Table 1, using priority scheduling algorithm, what will be the average waiting time for the following set of processes? (Lower value means higher priority)
   A. 7.75 B. 7.5 C. 5.25 D. 5

6. Consider Table 1, what is the minimum possible value of normalized turnaround time?
   A. 0 B. 1 C. -1 D. 2

7. Which memory allocation policy allocates the largest hole to the process?
A. Best-fit B. Worst-fit C. First-fit D. Next-fit

8. To ensure no preemption, if a process is holding some resources and requests another resource that cannot be immediately allocated to it:
A. The process waits for the resources to be allocated to it.
B. The process keeps sending requests until the resource is allocated to it.
C. The process resumes execution without the resource being allocated to it.
D. All resources currently being held are preempted.

9. Which one of the process scheduling algorithms is preemptive?
A. First Come First Serve B. Shortest Job First
C. Round Robin D. None

10. The Banker's algorithm is used to
A. Prevent deadlock B. Detect deadlock
C. Avoid deadlock D. Recover from deadlock

11. How many page faults will occur for the following reference string using least recently used (LRU) page replacement algorithm with frame size as 4 (assuming all frames are initially empty)?
4 3 2 1 4 3 5 4 3 2 1 5
A. 6 B. 7 C. 8 D. 9

12. Loading in the memory only those pages that are needed at the instant of time of execution is called
A. Paging B. Demand paging C. Swapping D. Segmentation

13. Select the correct statement.
A. In a partition that does not contain any bootable operating system, there is no boot block.
B. Random access to a file is faster with linked list allocation method than with contiguous allocation method.
C. File allocation table (FAT) exists in memory.
D. Any file specified by a user is first searched in its user directory.

14. When does thrashing occur?
A. When excessive swapping takes place
B. When you thrash your computer
C. When deadlock occurs
D. When no swapping takes place

15. Which of the following disk scheduling techniques has a drawback of starvation?
A. SCAN B. SSTF C. FCFS D. LOOK

16. The time taken to bring the desired track/cylinder under the head is called
A. Seek time B. Latency time C. Transfer time D. Read time

17. If the disk head is located initially at 32, what will be the number of disk moves required with FCFS if the disk queue of I/O requests are 98, 37, 14, 124?
A. 219 B. 260 C. 92 D. 290

18. What happens when a process requests for a DMA transfer?
    A. The process is temporarily suspended and another process gets executed.
    B. If the remaining time of the process is short, it continues execution, otherwise it is temporarily suspended.
    C. The process continues execution.
    D. The process is temporarily suspended but no other process can execute until the transfer completes.

19. Which directory structure allows sharing of a file or a directory?
    A. Single-level B. Two-level C. Tree D. Acyclic graph

20. In which of the following, the processor issues an I/O command, on behalf of a process, to an I/O module?
    A. Programmed I/O
    B. Interrupt-driven I/O
    C. Direct Memory Access
    D. Virtual Memory Access

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SECTION "B"

[6 Q. × 4 = 24 marks]

Attempt *ANY SIX* questions.

1. Discuss any two different architectural designs of operating systems. [2 + 2]

2. How is multi-programming (multi-tasking) achieved on a uniprocessor system? Explain briefly what happens during context switching between processes. [2 + 2]

3. What is deadlock? What is starvation? How do they differ from each other? [1 + 1 + 2]

4. Describe the difference between external and internal fragmentation. Describe how paging eliminates external fragmentation. [1 + 3]

5. What is a page fault? When the page fault occurs, a victim page must be selected for replacement. Describe some algorithms for handling this case. [1 + 3]

6. Compare and contrast blocking, non-blocking and asynchronous I/O. [2 + 2]

7. Describe with the help of a diagram a Unix inode. [4]

SECTION "C"

[2 Q. × 8 = 16 marks]

Attempt *ANY TWO* questions.

8. Explain the principle behind round-robin process scheduling algorithm. Consider the following scenario of processes with time quantum = 3 ms.

Process	Arrival time	Burst time
P1	0	5
P2	2	2
P3	3	7
P4	5	8
P5	8	5

Draw the Gantt chart for the execution of the processes, showing their start time and end time, using First-Come-First-Serve (FCFS), and round robin CPU scheduling algorithm. Calculate turnaround time, normalized turnaround time, and waiting time for each processes and average turnaround time, average normalized turnaround time and average waiting time for the system. [2 + 3 + 3]

9. Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 130, and the previous request was at cylinder 112. The queue of pending requests, in FIFO order, is 45, 2905, 415, 500, 834, 2109, 1111, 1234, 100. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for each of the following disk-scheduling algorithms? [2 + 2 + 2 + 2]

i. FCFS
ii. SCAN
iii. C-SCAN
iv. LOOK

10. Consider the following snapshot of a system:

	Allocation				**Max**			
	A	B	C	D	A	B	C	D
P1	1	1	0	1	4	1	2	2
P2	3	1	2	1	6	5	5	2
P3	0	1	3	1	4	3	8	2
P4	1	1	0	0	3	2	1	1
P5	2	0	0	0	5	3	3	2

Answer the following questions using the banker's algorithm:

i. If the system has 10 instances of resource A, 6 instances of resource B, 10 instances of C, and 5 instances of D, is the system in a safe state? If the state is safe, illustrate the order in which the processes may complete. Otherwise, illustrate why the state is unsafe. [4]
ii. If a request from process P_1 arrives for (0, 2, 4, 0), can the request be granted immediately? [3]
iii. Why is it difficult to implement the banker's algorithm? [1]