KATHMANDU UNIVERSITY
End Semester Examination [C]
May/June, 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 : 05 JUN 2019

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Encircle the most appropriate answer.

1. All of the following are tasks performed by operating systems except
   a. Managing hardware on the computer
   b. Controlling the access that application program has to the CPU
   c. Performing housekeeping task like file compression and disk defragmentation
   d. Provides an interface for user to interact with computer

2. Which of the following is true about real time operating systems?
   a. All processes have the same priority
   b. A task must be serviced by its deadline period
   c. Process scheduling can be done only once
   d. Kernel is not required

3. What is the ready state of a process?
   a. When a process is scheduled to run after some execution
   b. When a process is unable to run until some task has been completed
   c. When a process is using the CPU
   d. When a process is waiting for an I/O event to happen

4. A piece of code that only one thread can execute at a time is called
   a. Binary mutex b. Critical section c. Synchronization d. Race condition

5. Using priority scheduling algorithm, what will be the average waiting time for the following set of processes? (Lower value means higher priority)

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

   a. 7.75 b. 7.5 c. 5.25 d. 5

6. Each process has at least _____ threads.
   a. 0 b. 1 c. 2 d. 10

7. External fragmentation will not occur when
   a. Best-fit is used
   b. Worst-fit is used
   c. First-fit is used
   d. no matter which algorithm is used, it will always occur

8. Those processes should be aborted on occurrence of a deadlock, the termination of which
   a. is more time consuming b. incurs minimum cost
   c. does not affect safety of the system d. All of the mentioned

9. Which one of the process scheduling algorithms is non-preemptive?
   a. First Come First Serve
   b. Shortest Remaining Time First
   c. Round Robin
   d. None

10. When a process waits indefinitely for some resource, but other threads are actually using it, the situation is called
   a. Deadlock
   b. Starvation
   c. Aging
   d. Race condition

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. 5
   b. 6
   c. 7
   d. 8

12. The page table contains
   a. Page offset
   b. Page size
   c. Base address of each page in physical memory
   d. None

13. For a direct access file :
   a. Access is restricted permission wise
   b. Access is not restricted permission wise
   c. There are restrictions on the order of reading and writing
   d. There are no restrictions on the order of reading and writing

14. In paging the user provides only _____ which is partitioned by the hardware into _____ and _____
   a. One address, segment number, offset
   b. One offset, page number, address
   c. Page number, offset, address
   d. One address, page number, offset

15. In the single level directory:
   a. All files are contained in different directories all at the same level
   b. All files are contained in the same directory
   c. Depends on the operating system
   d. All files must have unique owners

16. The time taken for the desired sector to rotate to the disk head is called
   a. Seek time
   b. Positioning time
   c. Rotational latency
   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 contains 98, 37, 14, 124?
   a. 92
   b. 219
   c. 260
   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. On systems where there are multiple operating system, the decision to load a particular one is done by:

a. Boot loader
b. Bootstrap
c. Process control block
d. File control block

20. When device A has a cable that plugs into device B, and device B has a cable that plugs into device C and device C plugs into a port on the computer, this arrangement is called a

a. port
b. bus
c. daisy chain
d. Direct Memory Access

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F. M. : 40

SECTION "B"

[6 Q. × 4 = 24 marks]

Attempt *ANY SIX* questions.

1. What is the purpose of interrupts? How does an interrupt differ from a trap? Explain different types of exceptions. [1 + 1 + 2]
2. Describe the differences among short-term, medium-term, and long- term scheduling. [4]
3. What is deadlock? How can deadlocks be prevented? [1 + 3]
4. How do preemptive scheduling algorithms work? Explain how time quantum value and context switching time affect each other, in a round-robin scheduling algorithm. [2 + 2]
5. What is disk scheduling? Describe with examples some disk scheduling algorithms. Explain why SSTF scheduling tends to favor middle cylinders over the innermost and outermost cylinders. [1 + 2 + 1]
6. What is the main purpose of having Direct Memory Access (DMA) controller? Explain how it works. [1 + 3]
7. Explain different methods of allocating disk space to files. [4]

SECTION "C"

[2 Q. × 8 = 16 marks]

Attempt *ANY TWO* questions.

8. Explain the difference between internal fragmentation and external fragmentation. Given five memory partitions of 200 KB, 50 KB, 700 KB, 100 KB, 150 KB, and 500 KB (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of size 100 KB, 150 KB, 400 KB, 450 KB, and 125 KB (in order)? [2 + 2 + 2 + 2]
9. Consider the First-In-First-Out (FIFO) page replacement algorithm and the following reference string: 1 2 3 4 1 2 5 1 2 3 4 5
When the number of page frames increases from three to four, does the number of page faults go down, stay the same, or go up? Explain your answer. Also describe Belady's anomaly. What would have happened if Least Recently Used (LRU) page replacement algorithm was used? [4 + 2 + 2]
10. Consider the following state of a system with four processes, P1, P2, P3, and P4, and five types of resources, A, B, C, D, and E:

Allocation

	A	B	C	D	E
P1	0	1	1	1	2
P2	0	1	0	1	0
P3	0	0	0	0	1
P4	2	1	0	0	0

Request

A	B	C	D	E
1	1	0	2	1
0	1	0	2	1
0	2	0	3	1
0	2	1	1	0

Answer the following questions.

i. If the system has 2 instances of resource A, 4 instances of resource B, 1 instance of C, 4 instances of D, and 4 instances of D, detect if there is a deadlock in the system. If there is a deadlock, identify the processes that are deadlocked. [4]
ii. Describe some strategies to recover from deadlock. [3]
iii. How is the deadlock detection algorithm different from the banker's algorithm? [1]