KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2018

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 26 2018

SECTION "A"
[20 Q.×0.5=10 marks]

Tick (√) the best answer(s) or fill in the blanks with most appropriate word/phrase.

1. Which technology allows an Operating system to run as an application in other Operating System?
   [ ] Layered Structure
   [ ] Simple Structure
   [ ] Virtualization
   [ ] Microkernels

2. To access the services of operating system, the interface is provided by the
   [ ] API
   [ ] Library
   [ ] Assembly Instructions
   [ ] System Call

3. Which of the following scheduler selects the process from the mass storage device and loads them into the memory for execution?
   a) Long term Scheduler
   b) Job Scheduler
   c) Short-term Scheduler
   [ ] a & b  [ ] a & c  [ ] b & c  [ ] a, b & c

4. If a process is executing in its critical section, then no other processes can be executing in their critical section. This condition is called
   [ ] Progress
   [ ] Bounded waiting
   [ ] Mutual exclusion
   [ ] Critical exclusion

5. A monitor is a module that encapsulates:
   a) shared data structures
   b) procedures that operate on shared data structure
   c) synchronization between concurrent procedure invocation Direct Link
   [ ] a & b  [ ] b & c  [ ] a & c  [ ] a, b & c

6. Which of the following scheduling algorithms could result in starvation?
   [ ] First Come, First Served
   [ ] Shortest Job First
   [ ] Round Robin
   [ ] Priority

7. To ensure no preemption, if a process is holding some resources and requests another resource that cannot be immediately allocated to it:
   [ ] then the process waits for the resources be allocated to it.
   [ ] the process keeps sending requests until the resource is allocated to it.
   [ ] the process resumes execution without the resource being allocated to it.
   [ ] then all resources currently being held are preempted.

8. A claim edge, $P_i \rightarrow R_j$, in Resource-Allocation-Graph Algorithm indicates that:
   a) $P_i$ requests resource $R_j$
   b) Assignment of resource $R_j$ to $P_i$
   c) $P_i$ may requests resource $R_j$ at some time in future
   [ ] a only [ ] b only [ ] c only [ ] a & c

9. If the size of logical address space is $2^m$, and a page size is $2^n$ addressing units, then the high order _____ bits of a logical address designate the page number, and the ____ low order bits designate the page offset.
   [ ] m, n [ ] m – n, m [ ] n, m [ ] m – n, n

10. Which of the following dynamic storage allocation algorithm results in internal fragmentation?
    a) First fit
    b) Best fit
    c) Worst fit
    [ ] a only [ ] b only [ ] a & b [ ] b & c

11. Consider the following segment table:

| Segment | Base | Length |
|---|---|---|
| 0 | 219 | 600 |
| 1 | 2300 | 14 |
| 2 | 90 | 100 |
| 3 | 1327 | 580 |
| 4 | 1952 | 96 |

What is the physical address for logical address (2, 500)?

[ ] Addressing error [ ] 719 [ ] 2800 [ ] 590

12. In demand paging system with associated valid/invalid bit for each page table entry, what does the invalid bit signifies?
    a) the page is not valid
    b) valid but currently on the disk
    c) the associated page is legal and in memory
    [ ] a & b [ ] a & c [ ] b & c [ ] a, b & c

13. The algorithm in which we split **m** frames among **n** processes, to give everyone an equal share, m/n frames is known as:
    [ ] proportional allocation algorithm [ ] equal allocation algorithm
    [ ] split allocation algorithm [ ] priority allocation algorithm

14. A process is thrashing if _____
    [ ] it spends a lot of time executing, rather than paging
    [ ] page fault occurs
    [ ] it spends a lot of time paging, than executing
    [ ] it has no memory allocated to it

FEB 2 6 2018

15. What is mounting of file system?
[ ] removing portion of the file system into a directory structure
[ ] deleting a file system
[ ] attaching portion of the file system into a directory structure
[ ] creating of a file system

16. Which directory structure allows its directory to share its subdirectories and files?
[ ] Single level directory [ ] Two level directory
[ ] Tree Structure directory [ ] Acyclic graph directory

17. A file control block contains the information about:
a) File data blocks
b) Number of blocks in the partition
c) File owner
[ ] a & b [ ] a & c [ ] b & c [ ] a , b, & c

18. In which type of allocation method each file occupy a set of contiguous block on the disk?
[ ] contiguous allocation [ ] dynamic-storage allocation
[ ] linked allocation [ ] indexed allocation

19. The surface of the disk platter is logically subdivided into:
a. Sector
b. Cylinder
c. Spindle
d. tracks
[ ] a & b [ ] a & d [ ] a, b & d [ ] a, b, & c

20. If the disk head is located initially at 32, find the number of disk moves required with FCFS if the disk queues of I/O blocks requests are 98, 37, 14, 124, 65, 70
[ ] 321 [ ] 324 [ ] 310 [ ] 239

KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2018



Level : B. E. / B. Sc.
Year : III
Time : 2 hrs. 30 mins.

Course : COMP 307
Semester: I
F.M. : 40

SECTION "B"
[6 Q.×4=24 marks]

*Attempt any SIX questions.*

1. List five different categories of system call? Describe three main functions of an operating system with relevant examples? [1+3]

2. What is race condition? Explain Peterson's solution for solving the critical section problem with a pseudo code? [1+3]

3. Explain the difference between internal and external fragmentation? Consider a logical address space of 64 pages of 1,024 words each, mapped onto a physical memory of 32 frames.
   a. How many bits are there in the logical address?
   b. How many bits are there in the physical address? [2+2]

4. What is page fault? Explain how page fault is handled in demand paging with suitable block diagram? [1+3]

5. Consider a system that supports the strategies of contiguous, linked, and indexed allocation. What criteria should be used in deciding which strategy is best utilized for a particular file? Describe two different methods for accessing a file in a disk? [2+2]

6. Disk requests come in to the disk driver for cylinders 10, 22, 20, 2, 40, 6, and 38, in that order. A seek takes 6 ms per cylinder. How much seek time is needed for
   (a) First-come, first served.
   (b) Closest cylinder next.
   (c) Elevator algorithm (initially moving upward).

   In all cases, the arm is initially at cylinder 20. [4]

7. Write Short notes on: [2+2]
   i. DMA Controller
   ii. I/O Interface

SECTION "C"
[2 Q.× 8=16 marks]

*Attempt any TWO questions.*

8. Which type of process is generally favored by a multilevel feedback queuing scheduler a processor-bound process or an I/O-bound process? Briefly explain why. Five batch jobs, A through E, arrive at a computer center at essentially the same time. They have an estimated running time of 15, 9, 3, 6, and 12 minutes, respectively. Their (externally defined) priorities are 6, 3, 7, 9, and 4, respectively, with a lower value corresponding to a higher priority. For each of the following scheduling algorithms, determine the turnaround time for each process and the average turnaround for all jobs. Ignore process switching overhead. Explain how you arrived at your answers. In the last three cases, assume that only one job at a time runs until it finishes and that all jobs are completely processor bound.

a. Round robin with a time quantum of 1 minute
b. Priority scheduling
c. FCFS (run in order 15, 9, 3, 6, and 12)
d. Preemptive shortest job first [3+5]

9. Explain segmentation technique used for managing the main memory with suitable segmentation hardware block diagram? How segmentation supports the relocation? [4]

What do you mean by Belady's anomaly? Which page replacement algorithm never suffers from Belady's anomaly? A computer has four page frames. The time of loading, time of last access, and the R (Referenced) and M (Modified) bits for each page are as shown below (the times are in clock ticks):

| Page | Loaded | Last Reference | R | M |
|---|---|---|---|---|
| 0 | 126 | 280 | 1 | 0 |
| 1 | 230 | 265 | 0 | 1 |
| 2 | 140 | 270 | 0 | 0 |
| 3 | 110 | 285 | 1 | 1 |

a) Which page will FIFO replace?
b) Which page will LRU replace?
c) Which page will second chance replace? [4]

10. Describe four different conditions that result to a deadlock with suitable example? Given the following state for the Banker's Algorithm. 6 processes P0 through P5 4 resource types: A (15 instances); B (6 instances) C (9 instances); D (10 instances) Snapshot at time ***T0***: [2+6]

**Available**

| A | B | C | D |
|---|---|---|---|
| 6 | 3 | 5 | 4 |

| | **Current allocation** | | | | **Maximum demand** | | | |
|---|---|---|---|---|---|---|---|---|
| **Process** | **A** | **B** | **C** | **D** | **A** | **B** | **C** | **D** |
| P0 | 2 | 0 | 2 | 1 | 9 | 5 | 5 | 5 |
| P1 | 0 | 1 | 1 | 1 | 2 | 2 | 3 | 3 |
| P2 | 4 | 1 | 0 | 2 | 7 | 5 | 4 | 4 |
| P3 | 1 | 0 | 0 | 1 | 3 | 3 | 3 | 2 |
| P4 | 1 | 1 | 0 | 0 | 5 | 2 | 2 | 1 |
| P5 | 1 | 0 | 1 | 1 | 4 | 4 | 4 | 4 |

a. Verify that the Available array has been calculated correctly.
b. Calculate the Need matrix.
c. Show that the current state is safe, that is, show a safe sequence of processes. In addition, to the sequence show how the Available (working array) changes as each process terminates.
d. Given the request (3,2,3,3) from Process P5. Should this request be granted? Why or why not?