

KATHMANDU UNIVERSITY
End Semester Examination
July/August, 2024

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

01 AUG 2024

Course : COMP 307
Semester : I
F. M. : 50

SECTION "B"

[6 Q. × 4 = 24 marks]

Attempt ANY SIX questions.

1. What inconveniences that a user can face while interacting with a computer system, which is without an operating system? Describe smart card operating system? [2+2]
2. State four advantages of cooperating processes. Describe the solution for classical synchronization bounded buffer (Producer Consumer) problem using semaphores? [1+3]
3. Describe Segmentation with suitable block diagram and write its advantage over Contiguous memory allocation technique? Consider a computer system with a 32-bit logical address and 4-KB page size. The system supports up to 512 MB of physical memory. How many entries are there in each of the following? [2+2]
4. Explain the difference between internal fragmentation and external fragmentation? Explain how page fault is handled in demand paging with suitable block diagram? [1+3]
5. What is File Control block (FCB)? Describe indexed allocation of disk space with suitable block diagram? [1+3]
6. Disk Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order, is [4]
86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130
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?
a. FCFS b. SSTF c. SCAN d. C-LOOK
7. Write Short notes on: [2+2]
a. Characteristics of I/O Devices
b. Direct Memory Access (DMA)

SECTION "C"

[2 Q. × 8 = 16 marks]

Attempt ALL questions.

8. What are the differences between fixed partitioning and variable partitioning system of memory for multiprogramming? Given reference to the following pages by a program: **1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6**
How many page faults will occur if the program has 4 frames for Optimal, Least recently used Page Replacement algorithm [3+5]

P.T.O.

9. Consider the following set of processes, with the length of the CPU burst time given in milliseconds.

<u>Process</u>	<u>Burst Time</u>	<u>Priority</u>
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

The process are assumed to arrive in the order P1, P2, P3, P4, P5 all at time 0.

- Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, a non-preemptive priority and RR(quantum = 1) scheduling.
 - What is turnaround time of each process for each of the scheduling algorithm?
 - What is the waiting time of each process for each of the scheduling algorithm?
 - Which of the scheduler result of minimal average waiting time? [4+2+1+1]
10. Describe the methods for recovery from Deadlock? Consider a system with four processes P1 to P4 and four resource types A, B, C and D. Resource type A has 6 instances, resources type B has 4 instances, resources type C has 8 instances and resource type D has 5 instances. Suppose that at time T0 the following snapshot of the system has been take

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

At time T1 process P2 made a request for (0, 1, 1, 0) resources. After granting this request, determine whether the system will still be in safe state? Justify your answer. [3+5]

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Marks Scored:

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Registration No.:

Date : 01 AUG 2024

20 SECTION "A"

[10 Q. \times 0.5 = 5 marks]

Choose and mark [X] in the most appropriate option:

1. What is the main characteristic of a distributed operating system?
 It runs on a single machine
 It provides real-time processing capabilities
 It manages a group of distinct computers and makes them appear to be a single computer
 It is used for batch processing
2. In the context of operating system structures, what is the main purpose of a shell?
 To manage memory allocation
 To provide a user interface for accessing the kernel services
 To handle file system operations
 To control hardware devices directly
3. A situation where several processes access and manipulate the same data concurrently and the outcome of the execution depends on the particular order in which access takes place is called _____
 data consistency race condition aging starvation
4. A process moves from the "running" state to the "waiting" state when:
 It has completed execution
 It needs I/O or some event to complete
 It is preempted by a higher priority process
 It is terminated by the user
5. What is a critical section in the context of process synchronization?
 A section of code where shared resources are accessed
 A process that has the highest priority in the system
 A section of code where deadlock may occur
 A method used to allocate system resources to different processes
6. Which of the following statements is/are true?
a. Shortest remaining time first scheduling may cause starvation
b. Preemptive scheduling may cause starvation
c. Round robin is better than FCFS in terms of response time
 a only a & c b & c a, b & c
7. An edge, $R_j \rightarrow P_i$, 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

8. In deadlock prevention, which strategy can be used to ensure that the "hold and wait" condition is not met?
- Ensure that all resources are requested at once
 - Allow processes to hold resources indefinitely
 - Preempt resources from other processes
 - Ensure circular wait condition exists.
9. Consider six memory partitions of sizes 200 KB, 400 KB, 600 KB, 500 KB, 300 KB and 250 KB, where KB refers to kilobyte. These partitions need to be allotted to four processes of sizes 357 KB, 210 KB, 468 KB and 491 KB in that order. If the best fit algorithm is used, which partitions are NOT allotted to any process?
- 250 KB and 300 KB
 - 200 KB and 300 KB
 - 200 KB and 250 KB
 - 300 KB and 400 KB
10. Which memory allocation technique can suffer from both internal and external fragmentation?
- Paging
 - Contiguous Allocation
 - Segmentation
 - Dynamic Partitioning
11. Given a logical address space of 64 KB and segment sizes of 16 KB, how many segments can the address space be divided into?
- 4 segments
 - 8 segments
 - 16 segments
 - 32 segments
12. Given a page reference string: 1, 2, 3, 4, 5, 1, 2, 3, 4, 5 and a frame size of 4, how many page faults occur using the FIFO page replacement algorithm?
- 8
 - 9
 - 7
 - 6
13. The algorithm in which we allocate memory to each process according to its size is known as _____
- proportional allocation algorithm
 - split allocation algorithm
 - equal allocation algorithm
 - priority allocation algorithm
14. In a demand paging system, what happens when a page fault occurs?
- The page is immediately removed from memory
 - The process is terminated
 - The required page is loaded into memory from disk
 - The system shuts down
15. What is the primary role of file access control in operating systems?
- To manage the physical storage of files
 - To increase the speed of file retrieval
 - To enforce rules on how files are accessed and modified
 - To organize files into directories
16. What is a "symbolic link" in a directory structure?
- A file that stores directory metadata
 - A directory that points to another directory
 - A file that acts as a shortcut or reference to another file or directory
 - A special directory used for system configurations

17. Which of the following is a common method for attaching a disk to a computer system?
a. IDE (Integrated Drive Electronics)
b. USB
c. SATA (Serial ATA)
 a only c only a & c a, b, & c
18. What is a "cylinder" in disk structure terminology?
 set of tracks on all disk surfaces aligned vertically
 A single track on a disk platter
 A sector of a track
 A collection of sectors across multiple disks
19. The _____ program initializes all aspects of the system, from CPU registers to device controllers and the contents of main memory, and then starts the operating system
 main bootloader bootstrap rom
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 _____
 port daisy chain bus cable

