OS - Assignment- 2

Instructions:

☞ *Handwritten answers should be submitted either in A4 sized papers or loose sheets.*

☞ *Assignment must be submitted within specified deadline and with proper cover page by clearly mentioning subject name, assignment number , submitters information (name, roll-number and section)*

☞ *The answers should be written after understanding the concepts and blindly copying from others is strictly discouraged.*

Recommendations:

☞ *Students are highly recommended to follow text-books and internationally recognized reference books, research papers and authentic websites/blogs/tutorials.*

Answer the following questions:

1. Discuss about process deadlock with required conditions for deadlock

2. Explain about following deadlock handling techniques in detail

   a. Deadlock avoidance

   b. Deadlock prevention

   c. Deadlock avoidance

   d. Deadlock detection

   e. Deadlock Recovery

3. Discuss about Bankers algorithm for deadlock avoidance for single instance resource and multi instance resources (explain the concept separately and provide numerical example for each)

4. Consider the following four resources A, B, C and D with five processes. Is the system in a safe state? Use Banker's algorithm. If yes give the sequence.

	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				

Collected by Bipin Timalsina

5. Explain the concept first and differentiate between followings

   a. Contiguous memory allocation and non-contiguous memory allocation

   b. Fixed size partition and variable size partition

   c. Internal fragmentation and external fragmentation

   d. Paging and Segmentation

   e. Segmentation and Fragmentation

6. List different memory allocation techniques (First Fit, Next Fit, Best Fit, and Worst Fit) in contiguous memory management. (Concept, example & pros and cons for each technique)

7. Suppose that we have memory of 1000 KB with 5 partitions of size 150 KB, 200 KB, 250 KB, 100 KB, and 300 KB. Where the processes A and B of size 175 KB and 125 KB will be loaded, if we used Best-Fit and Worst-Fit strategy?

8. How free space can be managed in memory management? (Explain about bitmap and linked list approaches with proper examples)

9. What size of bitmap is require to manage free space in 8 GB memory? (Size of one allocation unit is 2 KB)

10. Solve the following problems:

    a. Calculate the size of memory if its address consists of 22 bits and the memory is 2-byte addressable.

    b. Calculate the number of bits required in the address for memory having size of 16 GB. Assume the memory is 4-byte addressable (size of one location is 4 byte)

    c. Consider a system with byte-addressable memory, 32 bit logical addresses, 4 kilobyte page size and page table entries of 4 bytes each. Compute the size of the page table in the system in megabytes.

    d. Consider a machine with 64 MB physical memory and a 32 bit virtual address space. If the page size is 4 KB, what is the approximate size of the page table?

    e. In a virtual memory system, size of virtual address is 32-bit, size of physical address is 30-bit, page size is 4 Kbyte and size of each page table entry is 32-bit. The main memory is byte addressable. Now calculate the maximum number of bits that can be used for storing protection and other information in each page table entry?

11. Explain about how logical address is converted to physical table in paging with suitable example.

12. Consider a virtual memory and physical memory of size 128-MB and 32-MB respectively. Assume that page size is 4-KB. What will be the number of bits required for page number, frame number, and offset? Find physical address for the virtual address 20500. (Assume that value at index 5 of page table is 2). Suitable diagram is necessary

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13. In a computer system, the memory is organized using a paging scheme. The system has a total of 64 pages and uses frames of 4 KB each. Calculate the number of bits required for the page number, frame number, and offset in the paging scheme.

14. Discuss about page table and TLB with pros and cons for each.

15. How operating system handles page fault? Explain with suitable diagram.

16. Discuss about page table and TLB with pros and cons for each.

17. Describe about the concept and working of segmentation in memory management.

18. Explain about segmentation with paging.

19. What is page replacement? Explain about following page replacement algorithms with algorithm and pros & cons for each :

    a.   FIFO

    b.   Second Chance

    c.   LRU

    d.   Optimal

    e.   LFU

    f.   Clock

20. Consider the following page reference string 1, 3, 5,4, 7, 1, 5, 6, 1, 2, 3, 7, 6, 3, 4, 1, 3, 8. How many page faults would occur for each of the following page replacement algorithms assuming 3 frames?

    a.   FIFO

    b.   Second Chance

    c.   LRU

    d.   Optimal

    e.   LFU

    f.   Clock

21. Explain about WS-Clock page replacement algorithm in detail

22. Discuss about following file allocation techniques with examples : (write pros and cons for each)

    a.   Contiguous Allocation

    b.   Linked Allocation

    c.   Allocation using FAT

    d.   I-nodes

23. Consider a UNIX style Inode with 12 direct pointers, 1 single indirect pointer, 1 double indirect pointer and 1 triple indirect pointer. Compute the maximum size of a file that can be indexed by such inode if the size of a block is 8KB and each pointer is of 4 bytes.

24. Explain about bitmaps and linked list approaches for free space management in file management.

25. How much space required in memory to store bitmap for 20 GB hard disk with 2KB block size?

26. Write short notes on:
    a. File system layout
    b. Hierarchical Directory system
    c. Directory implementation
    d. Shared files
    e. File attributes

27. Explain about following concepts
    a. Classification of I/O Devices
    b. Memory mapped I/O
    c. DMA operation
    d. Interrupts
    e. Disk structure (Structure of Hard Disk)
    f. Disk formatting
    g. Cylinder skew and Interleaving in Disk
    h. Error handling in Disk
    i. RAID and Different types of RAID

28. Explain about goals of I/O software.

29. Explain about Programmed IO, Interrupt driven IO and IO using DMA with their pros and cons. How they are different from each other.

30. Consider a disk pack with the following specifications- 16 surfaces, 128 tracks per surface, 256 sectors per track and 512 bytes per sector. Answer the following questions-
    a. What is the capacity of disk pack?
    b. What is the number of bits required to address the sector?

31. Discuss about disk scheduling concept. Explain about following algorithms in disk (write pros and cons for each algorithms)
    a. FCFS
    b. SSTF
    c. SCAN
    d. CSCAN
    e. LOOK
    f. CLOOK

32. Suppose that a disk drive has the cylinder numbered from 0 to 4999. The head is currently at cylinder number 143. The queue for services of cylinder is as 86, 1470, 913, 948, 1509,1774, 1022, 1750 and 130. What is the total head movement in each of the following disk algorithm to satisfy the requests?

    a. FCFS

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b. SSTF

c. SCAN

d. CSCAN

e. LOOK

f. CLOOK