

Started on Wednesday, 7 May 2025, 11:00

State Finished

Completed on Wednesday, 7 May 2025, 11:25

Time taken 25 mins 16 secs

Grade 100.00 out of 100.00

Question 1

Correct

Mark 3.00 out of 3.00

In a system with a 48-bit virtual address and 4KB pages, how many entries are in a single-level page table?

- ☐ 2^{24}
- ☐ 2^{48}
- ☐ 2^{12}
- ☒ 2^{36} ✓

Question 2

Correct

Mark 3.00 out of 3.00

What is the main advantage of RAID 1?

- ☒ Fault tolerance through mirroring ✓
- ☐ Dynamic disk expansion
- ☐ Increased read/write speed
- ☐ Reduced storage cost

Question 3

Correct

Mark 3.00 out of 3.00

Polling vs. Interrupts: Which is more CPU-efficient?

- ☐ Depends on disk speed
- ☐ Both are equal
- ☒ Interrupts ✓
- ☐ Polling

Question 4

Correct

Mark 3.00 out of 3.00

Why does DMA improve performance for disk I/O?

- ☐ None of the mentioned
- ☒ It allows the CPU to execute while data is transferred ✓
- ☐ It reduces main memory interrupts
- ☐ It uses smaller chunk sizes

Question 5

Correct

Mark 3.00 out of 3.00

A process has a working set size of 10 pages, but the OS allocates only 5 frames. This will likely cause:

- ☐ Efficient caching
- ☐ High CPU utilization
- ☒ Thrashing ✓
- ☐ Deadlock

Question 6

Correct

Mark 3.00 out of 3.00

In a system using the CLOCK algorithm, a page's reference bit is set to 1 but its modify bit is 0. What happens when this page is selected for replacement?

- ☐ It is written to disk first
- ☐ It is evicted immediately
- ☐ The algorithm skips it
- ☒ Its reference bit is cleared, and it gets a "second chance" ✓

Question 7

Correct

Mark 3.00 out of 3.00

Copy-on-write (COW) is used for:

- ☐ Reducing page faults
- ☒ Fast process creation (e.g., fork()) ✓
- ☐ Disk caching
- ☐ Implementing LRU replacement

Question 8

Correct

Mark 10.00 out of 10.00

A system uses **4** page frames for storing process pages in main memory. It uses the **First In First Out (FIFO)** page replacement policy. Assume that all the page frames are initially empty.

What is **the total number of page fault** that will occur while processing the page reference string given below?

5 0 2 1 0 3 0 2 4 3 0 3

The total number of page fault is .

Question 9

Correct

Mark 15.00 out of 15.00

To detect errors in a hard disk block, we need to count the number of **1**'s. The block contains binary data. Binary data is a type of data that only has two possible values (0 and 1).

Complete the skeleton code of a program that is trying to count how many *digits* of a series of binary data that are a **1**.

To help you with this task, please write a function called **countOnes** that computes the number of digits of an input binary data that are equal to **1**. Be sure to also write a prototype for this function.

Next, please use **countOnes** in your main function.

The first input is how many series of binary data, followed by the strings (see the test cases).

Display **the total count of ones**.

Test case 1:

Input:

2

00011100 110

Output:

5

Test case 2:

Input:

3

00011100 110 111

Output:

8

Test case 3:

Input:

1

000000

Output:

0

For example:

Input	Result
2 00011100 110	5
3 00011100 110 111	8
1 101010111	6

Answer: (penalty regime: 0, 100, ... %)

Reset answer

```
1 #include <stdio.h>
2
3 // add a prototype for countOnes below
4
5 int countOnes(const char *binStr);
6
7
8 // complete the main function to read input, call countOnes, and display output
9 int main() {
10     int n;
```

```

11
12 ▾ if (scanf("%d", &n) != 1) {
13     return 1; // error reading input
14 }
15
16 int total = 0;
17 char str[1024];
18 // Loop over each binary string, count its '1's, and accumulate
19 ▾ for (int i = 0; i < n; i++) {
20 ▾     if (scanf("%1023s", str) != 1) {
21         return 1;
22     }
23     total += countOnes(str);
24 }
25
26 printf("%d\n", total);
27 return 0;
28 }
29
30 // add the function definition for countOnes below
31 ▾ int countOnes(const char *binStr) {
32     int count = 0;
33 ▾     for (int i = 0; binStr[i] != '\0'; i++) {
34 ▾         if (binStr[i] == '1') {
35             count++;
36         }
37     }
38     return count;
39 }
40

```

	Input	Expected	Got	
✓	2 00011100 110	5	5	✓
✓	3 00011100 110 111	8	8	✓
✓	1 101010111	6	6	✓
✓	1 0000000	0	0	✓

Passed all tests! ✓

Correct

Marks for this submission: 15.00/15.00.

Question 10

Correct

Mark 3.00 out of 3.00

What triggers a page fault?

- ☐ The TLB misses
- ☐ The page table is full
- ☒ A process accesses a page not in physical memory ✓
- ☐ A disk error occurs

Question 11

Correct

Mark 3.00 out of 3.00

Why is thrashing harmful to system performance?

- ☐ It slows down CPU clock speed
- ☐ It corrupts the file system
- ☒ It causes excessive disk I/O due to constant page swaps ✓
- ☐ It disables the TLB

Question 12

Correct

Mark 3.00 out of 3.00

What is the role of a device driver?

- ☐ Allocate memory to processes
- ☐ Manage CPU scheduling
- ☐ Implement page replacement algorithms
- ☒ Translate OS I/O requests to hardware-specific commands ✓

Question 13

Correct

Mark 3.00 out of 3.00

What is the primary purpose of a page table?

- ☐ To manage CPU scheduling queues
- ☐ To store frequently accessed disk blocks
- ☐ To cache file system metadata
- ☒ To map virtual addresses to physical addresses ✓

Question 14

Correct

Mark 3.00 out of 3.00

Which statement about *interrupt-driven I/O* is true?

- ☐ It requires a separate I/O processor
- ☐ The CPU continuously polls devices for status
- ☒ Devices notify the CPU when I/O is complete ✓
- ☐ It has higher CPU overhead than DMA

Question 15

Correct

Mark 3.00 out of 3.00

What is the primary purpose of a TLB (Translation Lookaside Buffer)?

- ☐ Speed up interrupt handling
- ☐ Manage file system metadata
- ☐ Store frequently accessed disk blocks
- ☒ Cache recent virtual-to-physical address translations ✓

Question 16

Correct

Mark 3.00 out of 3.00

What is the purpose of the "dirty bit" in a page table entry?

- ☐ Implement LRU replacement
- ☐ Prevent TLB flushes
- ☒ Identifies pages changed in RAM ✓
- ☐ Track page faults

Question 17

Correct

Mark 10.00 out of 10.00

If, in a dynamic partition memory management system, the current value of the base register is **42993** and the current value of the limit register is **2031**, compute the physical address that correspond to the following logical address:

1755

The physical address is .

Question 18

Correct

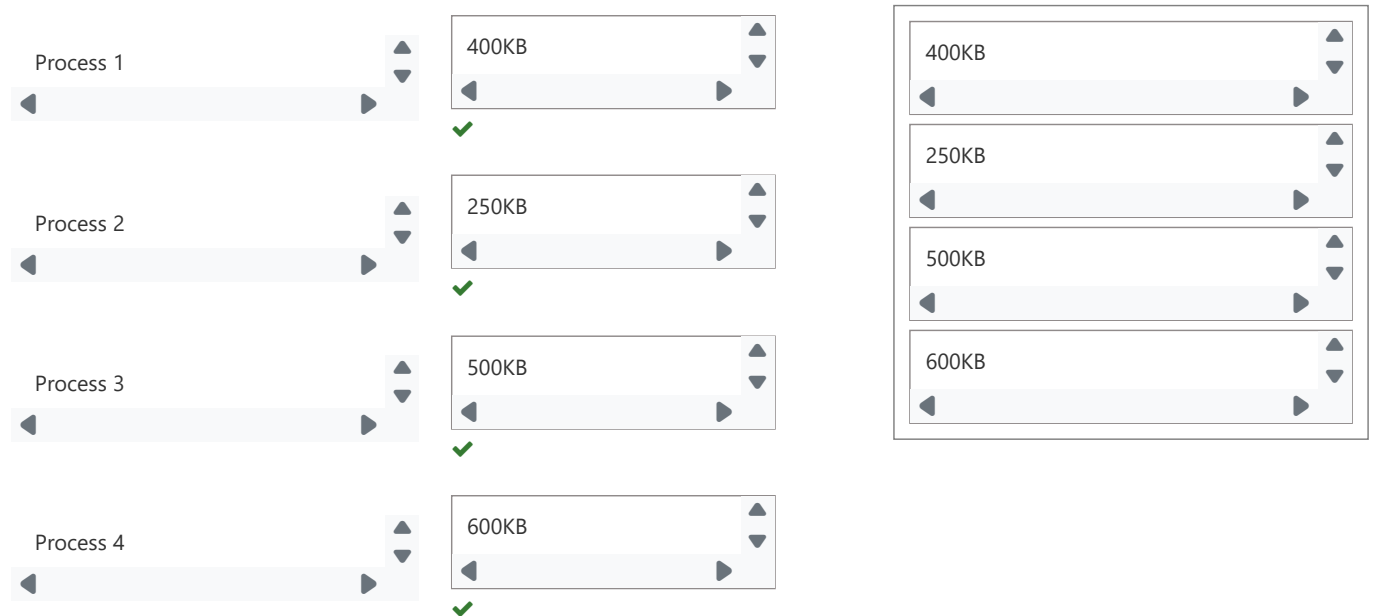
Mark 10.00 out of 10.00

Consider four memory partitions of size **400 KB, 600 KB, 500 KB** and **250 KB**. These partitions need to be allocated to four processes of sizes:

- Process P1 = 357 KB
- Process P2 = 210 KB
- Process P3 = 468 KB
- Process P4 = 491 KB

in that order.

Perform the allocation of processes using **Best Fit Algorithm**.

**Question 19**

Correct

Mark 10.00 out of 10.00

Consider a disk queue with I/O requests on the following cylinders in their arriving order:

6, 10, 12, 54, 97, 73, 128, 15, 44, 110, 34, 45

The disk head is assumed to be at Cylinder **23** and moving in the direction of decreasing number of cylinders.

The disk consists of a total of **150** cylinders. Calculate the **total disk head movement** using the **LOOK**-scheduling algorithm.

The total disk head movement is .

Question 20

Correct

Mark 3.00 out of 3.00

Which I/O scheduling algorithm prioritizes the nearest disk request first?

- ☒ SSTF ✓
- ☐ C-SCAN
- ☐ FCFS
- ☐ SCAN