NYU, Tandon School of Engineering

Bridge to Computer Science Program

4th Exam

Thursday 23 May 2024

- You have two hours
- There are 100 points total.
- Note that there are longer problems at the end. Be sure to allow enough time for these.
- We supplied you with a file, named 'solutions.txt', where you should type all your answers.
- Write your name, netID and NYU ID at the head of the solutions file.
- For editing this file, you are allowed to use only plain text editors (Notepad for Windows users, or textEdit for Mac users).
- You are permitted to use Visual Studio (C++) or XCode as compilers. And Textedit/Notepad for text editing
- Calculators are not allowed.
- This is a closed-book exam. No additional resourced are allowed.
- Pay special attention to the style of your code. Indent your code correctly, choose meaningful names for your variables, define constants where needed, choose most suitable control statements, etc.
- In all questions you may assume that the users enter inputs as they are asked. For example, if the program expects a positive integer, you may assume that users will enter positive integers.
- No need to document your code in this exam, but you may add comments if you think they are needed for clarity.
- Read every question completely before answering it.
- When done, please upload your answer file to Brightspace.nyu.edu, Gradescope and email to dkatz@nyu.edu

1) (3 pts) In a system which support Threads, where would the stack pointer be found?
    a. Secondary Storage
    b. Translation lookaside buffer
    c. Thread control block
    d. Process control block

2) (3 pts) Which page replacement algorithm involving finding which page to steal based on checking “use” bits in a circular pattern?
    a. VSWS
    b. PFF
    c. Clock
    d. Diffie-Hellman

3) (3 pts) Which protocol is responsible for end to end transmission in a reliable data transport protocol?
    a. Ethernet
    b. IP
    c. HTTP
    d. TCP

4) (3 pts) In order to protect critical sections, programmers should use _____ and the programmer should call wait prior to the critical section and signal after.

5) (3 pts) To retrieve a web page, the HTTP verb _____ is used and is recognizable as the first bytes in the request.

6) (10 pts) If an IPv4 packet with the don’t fragment flag set arrives at a network where the MTU is less than the size of the packet, what will happen to the packet?

7) (10 pts) Explain what will happen to a running user program when the CPU receives an interrupt while running the code.

8) (15 pts) One deadlock prevention strategy involves eliminating the ability to have a circular wait. Explain how you would implement this strategy for your program.

9) (10 points) List and describe the packets that are sent and received by a program in order to form a TCP socket before beginning to transmit any data.

10) (10 pts) Explain in English, you do not need to provide math, how a logical address is converted to a physical address inside the MMU given a system of paging without virtual memory.

11) (10 pts) When a packet traverses a router, there are many forms of delay. Explain three parts of the overall “nodal” delay experienced for each router/link.

12) (20 pts) You are given a pointer to the first node in a binary search tree and a single value which may or may not be present in the tree. You are asked to determine if there is any value in the tree greater than the given value. For example, if the tree were as depicted below and the given value was 20 the result would be false. However,given the tree below and a value of 9, the result would be true. You will be graded on efficiency as well as correctness.