

Introduction to Scientific and Engineering Computation Midterm Exam

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Soru	1a	1b	2a	2b	3a	3b	Toplam
Puan	/ 15	/ 15	/ 15	/ 10	/ 25	/ 20	/ 100

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1. Assume that the program code given below is written to calculate the series $\pi = 4 - \frac{4}{3} + \frac{4}{5} - \frac{4}{7} + \frac{4}{9} - \frac{4}{11} + \dots$.

```
for (i = 0; i < 100; i++) {  
    a = a + 2;  
    if (b < 0)  
        b = 4 / a;  
    else  
        b = -4 / a;  
    pi = pi + b;  
}
```

- (a) Draw the flowchart for this piece of code.

- (b) Explain what each variable represents in the code and write their definition statements including their initial values.

2. Assume that a system holds the following information for each file: name of the file (string), size of the file (integer), the time the file was last accessed (time). In that system the time is represented by the following information: year (integer), month (integer), day (integer), hour (integer), minute (integer), daylight_savings_time (boolean).
- (a) Write a structure definition that will represent a time in this system. Using this definition, write a second structure definition to represent a file.
- (b) Define a variable of this file type. Assuming that all fields of this variable is filled, write the statement that will set the daylight_savings_time of last access to true if the month is July.

3. ANSWER THIS QUESTION ON THE SECOND PAPER.

- (a) Write a program that will get a number from the user, simulate the roll of a die that number of times and count each occurrence.
- (b) If the number of occurrences of i is $observed_i$ and the expected number of occurrences of i is $expected_i$ (number of rolls / 6), write the piece of code that will compute and print the chi-square value defined by the below formula:

$$\chi = \sum_i \frac{(observed_i - expected_i)^2}{expected_i}$$