ENF1170: Introductory Computer Science
Some previous exams questions
11.05.2020

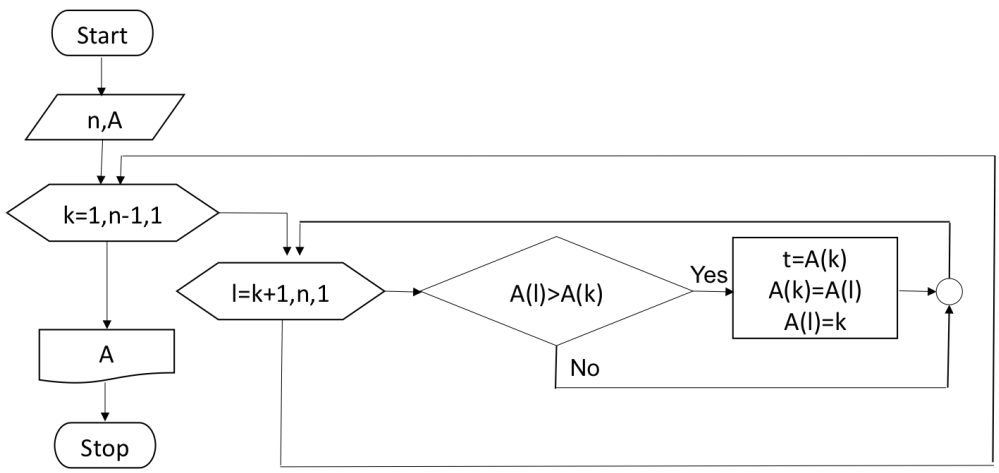
Answer all the questions. You have 60 minutes. Good luck!

1. Draw the flowchart of an algorithm/program that finds the hypotenuse of a right-angled triangle by using the lengths of the other sides entered by the user.

2. Draw a flowchart that sums of the first n positive integers and prints/displays the outcome.

3. Draw a flowchart that sums of the first n positive <u>and even</u> integers and prints/displays the outcome.

4. Solve the following problem using the flowchart below. Assume that $A = [2\ 5\ 1]$ and $n = 3$. (It is important to show your work and the result. You can use the table below.)



k	l	A(k)$_{old}$	A(l)$_{old}$	t	A(k)$_{new}$	A(l)$_{new}$

$A = [\qquad\qquad]$

5. *Draw the flowchart of a program that multiplies the cubes of even integers* $\left(\prod_{i=1}^{n} i^3\right)$ *and multiplies the squares of odd integers* $\left(\prod_{j=1}^{n} j^2\right)$ *between* 1 *and a number* (N) *entered by the user, then prints the results on the screen.*

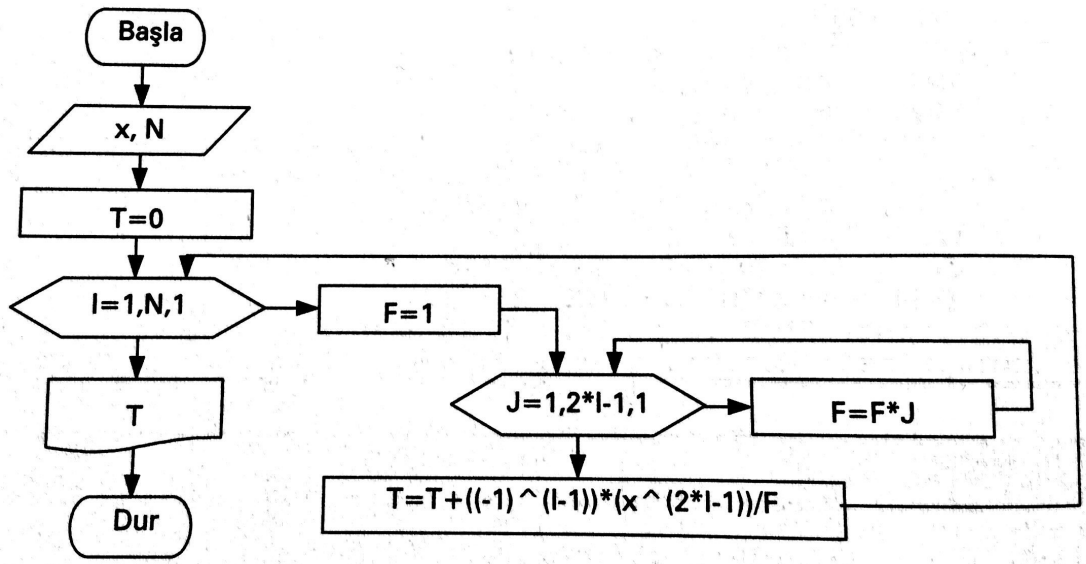
6. Draw the flowchart of a program that finds the geometric average of a vector, the size and elements of which are entered by the user.

$$\text{Geometric Average} = \sqrt[n]{A(1).A(2)...A(n)}$$

7. $sin(x)$ can be calculated by using Maclaurin expansion as follows:

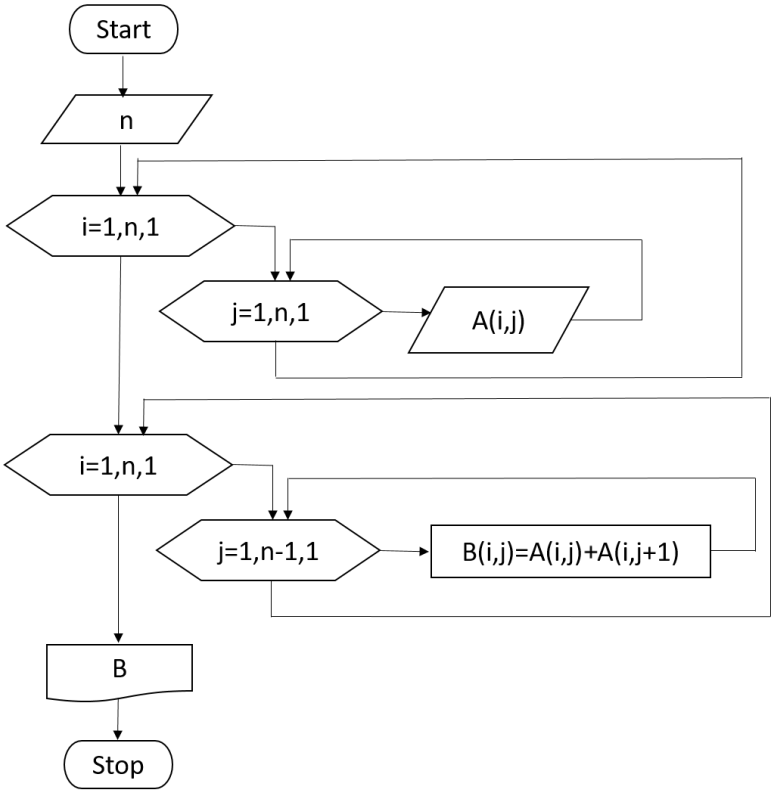
$$sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \frac{x^9}{9!} - \cdots = \sum_{k=1}^{\infty} \frac{(-1)^{k-1} x^{2k-1}}{(2k-1)!}$$

The flowchart of the algorithm/program that calculates $sin(x)$ using this formula is given below:



Write the MATLAB code of this algorithm.

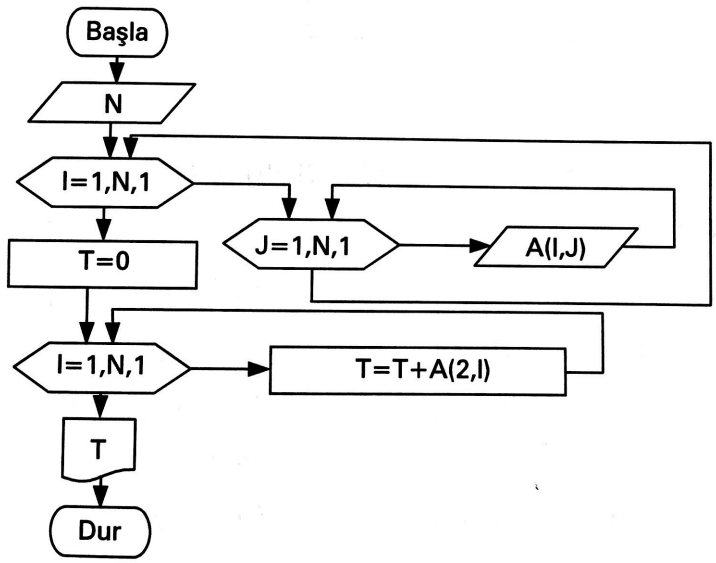
8. *Write the Matlab function for the following flowchart.*



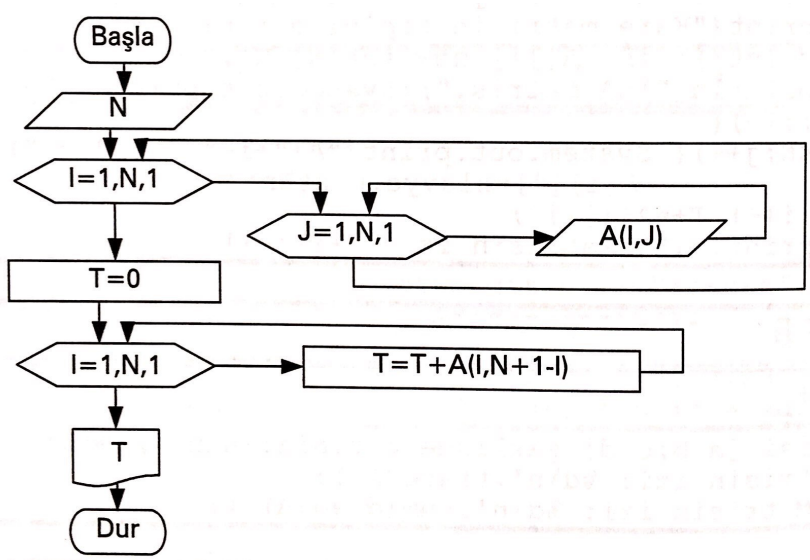
9. *Suppose someone runs your Matlab function in Question 3 and puts in the following matrix. Show the result*

$$\begin{bmatrix} 1 & 2 & 3 \\ 6 & 5 & 4 \\ 7 & 8 & 9 \end{bmatrix}$$

10. Write the Matlab code of the following flowchart.



11. Suppose someone runs the code of the following flowchart.



If she puts in the following A matrix as an input, what would be the result printed on the screen?

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 6 & 5 & 4 \\ 7 & 8 & 9 \end{bmatrix}$$

12.

a) Draw the flowchart of a program that calculates the average of the integer entries (elements) of the square matrix A, finds the closest integer and gets the row and column location of this integer in A. (Assume that this integer is found in A.)

b) Write the Matlab function for this flowchart (do not use Matlab built-in functions, such as 'mean($\cdot$)' *etc.*)