18XW47 – MATHEMATICAL COMPUTING LAB

M.Sc-Software Systems
– IV SEMESTER

PROBLEM SHEET – 4

1. Write a function file (name it eval) for the function $\frac{x^4\sqrt{3x+5}}{(x^2+1)^2}$. The input to the function is *x* and the output is y. Write the function such that *x* can be a vector. Use the function to calculate:
   (*a*) for *x* = 6.
   (*b*) for *x* = 1, 3, 5, 7, 9, and 11.
2. Write a function that calculates the average and the standard deviation of the following list of grades:80 75 91 60 79 89 65 80 95 50 81.
3. Write a function for the following math function:
   $$y(x) = -0.2x^4 + e^{-0.5x}x^3 + 7x^2$$
   Write the function such that x can be a vector (use element-by-element operations).
   (a) Use the function to calculate y(–2.5), and y(3).
   (b) Use the function to make a plot of the function $y(x)$ for $-3 \leq x \leq 4$.
4. Write a matlab program that gets a polynomial as input from the user and computes its roots.
5. Write a matlab program that gets a number from the user and outputs if it is odd or even.
6. Write a menu driven matlab program that gets two numbers from the user and performs each of the following operations based on the users choice of menu
   1. Addition
   2. Subtraction
   3. Multiplication
   4. Division
7. Write a matlab program to check whether a given number is positive or negative or equal to zero.
8. Write a program that takes an input, the temperature in Kelvin and prints
   a. **ICE** when the temperature is less than 32 degree,
   b. **WATER** when the temperature is less than 212 degree
   c. **STEAM** when the temperature is greater than 212 degree
9. Write a matlab program that gets a number from the user and outputs if it is prime or not.
10. Write a matlab program to print the multiplication table of 13 from 1 to 20.
11. Write a program to print the following pattern

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12. Write a program to print the following pattern

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13. Write a program to find the factorial of a given integer.

14. Write a program to print the Fibonacci series till a given n.
    Eg: $n = 5$

    Output :0 1 1 2 3 5

15. Write a for loop to compute the sum of the squares of all integers from 2 to 20.
16. Write a for loop to compute the sum of all of the odd integers from 1 to 501 (inclusive)
17. Suppose that $1000.00 is left to sit in a bank account that pays 8% interest per year, compounded annually. What is the account balance after 30 years? Create a plot of the annual balance from year 1 through year 30.
18. Suppose, starting at his 25th birthday, Michael deposits $5000 at the beginning of every year into a retirement annuity that pays 9% interest per year, compounded annually He wants to retire when his annuity first reaches or exceeds $1 million. In how many years will he be able to retire with this plan?
19. Write a user-defined MATLAB function that converts speed given in units of miles per hour to speed in units of meters per second. For the function name and arguments use mps = mph TO mets(mph). The input argument is the speed in mi/h, and the output argument is the speed in m/s. Use the function to convert 55 mi/h to units of m/s.

20. Write a user-defined MATLAB function that determines the area of a triangle when the lengths of the sides are given. For the function name and arguments use [Area] = triangle(a,b,c). Use the function to determine the areas of triangles with the following sides:
    (a) a = 3, b = 8, c = 10. (b) a = 7, b = 7, c = 5.

21. Write a user-defined MATLAB function that calculates a student's final grade in a course using the scores from three midterm exams, a final exam, and six homework assignments. The midterms are graded on a scale from 0 to 100and each accounts for 15% of the course grade. The final exam is graded on a scale from 0 to 100 and accounts for 40% of the course grade. The six homework assignments are each graded on a scale from 0 to 10. The homework assignment with the lowest grade is dropped, and the average of the remaining assignments accounts for 15% of the course grade. In addition, the following adjustment is made when the grade is calculated. If the average grade for the three midterms is higher than the grade for the final exam, then the grade of the final

exam is not used and the average grade of the three midterms accounts for 85% of the course grade. The program calculates a course grade that is a number between 0 and 100.

For the function name and arguments use g = fgrade(R). The input argument R is a matrix in which the elements in each row are the grades of one student. The first six columns are the homework grades (numbers between 0 and 10), the next three columns are the midterm grades (numbers between 0 and 100), and the last column is the final exam grade (a number between 0 and 100). The output from the function, g, is a column vector with the student grades for the course. Each row has the course grade of the student with the grades in the corresponding row of the matrix R. The function can be used to calculate the grades of any number of students. For one student the matrix R has one row. Use the function for the following cases:

(a) Use the Command Window to calculate the course grade of one student with the following grades: 8, 9, 6, 10, 9, 7, 76, 86, 91, 80.

(b) Write a program in a script file. The program asks the user to enter the students' grades in an array (one student per row). The program then calculates the course grades by using the function fgrade. Run the script file in the Command Window to calculate the grades of the following four students:

Student A: 7, 10, 6, 9, 10, 9, 91, 71, 81, 88.
Student B: 5, 5, 6, 1, 8, 6, 59, 72, 66, 59.
Student C: 6, 8, 10, 4, 5, 9, 72, 78, 84 78.
Student D: 7, 7, 8, 8, 9, 8, 83, 82, 81 84.

22. Write a program to compute the sum of the following series

$$1^2 - 3^2 + 5^2 - 7^2 + \cdots - 9999^2.$$

23. Write a program to print the square root of the even integers up to n
24. Write a program to sum all 1, 2, and 3 digit prime numbers.
25. Write a program to sum the composite numbers from 1 to 50.

26. Write a program that generates a random number between 3 and 10 until the number 5 occurs.
27. Write a program that generates an array of length 10 with random numbers between 3 and 10. [Note: Use 'While' loop]