RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

Bachelor of Science in Applied Sciences
First Year - Semester I Examination – July/August 2023

MAT 1206 – INTRODUCTION TO MATLAB

Time: Two and a half (2 ½) hours

Answer **any four (04)** questions.

1. a) Create a new script file and save it as "Q1_a.m". Write MATLAB codes to perform each of the following operations:

   i. $\frac{11}{215} \times 4.1 \times 2.5^4 - 2.025 \times 1.125$

   ii. $2.5e^{5/3} + \sin(\pi/6)$

   iii. $225\left(\sqrt[5]{2 + \cos(30°)}\right)$

   iv. Round the answer of part iii. to two decimal places.

   v. Find the ceiling and floor values of part iii. answer. **(25 marks)**

   b) i. Create a MATLAB function with the following specifications:
   - Function Name: fibonacci_sequence
   - Input: n (integer) - The number of terms in the Fibonacci sequence to generate.
   - Output: sequence (vector) - The generated Fibonacci sequence up to the n^{th} term.

ii. Inside the fibonacci_sequence function, write a MATLAB code to generate the Fibonacci sequence up to the n^{th} term following the Fibonacci rule given below:
   - The first two terms are 0 and 1.
   - Each subsequent term is the sum of the two preceding terms.

iii. Write a separate MATLAB script that performs the following tasks and save it as "Q1_b.m".
   - Prompt the user to enter an integer. This integer will determine the number of terms to be generated in the Fibonacci sequence. (User input validation is not required.)
   - Call the fibonacci_sequence function with the user-provided input.
   - Display the generated Fibonacci sequence.

(25 marks)

2. a) Create a new script file and save it as "Q2_a.m". Write a MATLAB code to plot the graph of the function, $f(x) = 2x^3 + x^2 + 3x - 2$, where $-5 \leq x \leq 5$. The graph should include:

   i. X-axis label: 'x'

   ii. Y-axis label: 'f(x)'

   iii. Title: 'Plot of f(x) =x^3 + x^2 - 3x + 2' **(25 marks)**

b) Create a new script file and save it as "Q2_b.m". Write a MATLAB code to draw a bar chart for the yearly expenses of the ABC company that are given in the following table:

Years	2001	2002	2003	2004	2005	2006	2007	2008
Expenses (in $)	5,000	6,000	4,500	7,000	5,500	8,000	7,500	9,000

Label the axes of the chart appropriately and title it as 'Yearly Expenses of ABC'.

(25 marks)

3. An external temperature monitoring system records temperature data for ten different cities in Sri Lanka. The data is stored in a CSV file named "temperature_data.csv." Each row in the file represents a city, and the columns contain the following information: City Name, Average Temperature (in Celsius) for 12 months in the year 2022.

   Create a new MATLAB script as "Q3.m" and write MATLAB codes to perform the following tasks:

   a) Read the temperature data from the CSV file. **(05 marks)**

   b) Calculate the average temperature for each city across all the months. **(10 marks)**

   c) Determine the cities with the highest and lowest average temperatures. **(05 marks)**

   d) Assign a rating to each city based on its average temperature using the following criteria:

      Rating A: Average temperature $\geq 30°C$

      Rating B: $30°C >$ Average temperature $\geq 25°C$

      Rating C: $25°C >$ Average temperature $\geq 20°C$

      Rating D: Average temperature $< 20°C$ **(15 marks)**

   e) Finally, save a summary of the temperature data, including the City Name, the average temperature, and the corresponding rating, to a text file named "temp_summary.txt." **(15 marks)**

4. Create a new MATLAB script as "Q4.m" and write MATLAB codes to solve the following equations:

   a) The quadratic equation: $1.5x^2 + 2.25x - 1.5 = 0$. **(15 marks)**

   b) The quartic equation: $2.2x^4 - 8.5x^3 + 8x^2 - 4.6x - 1.5 + 1 = 0$. **(15 marks)**

   c) The system of linear equations:

$$2x + 3y - z + 5w = 15,$$
$$x - 2y + 4z + 3w = 5,$$
$$3x + y + 2z - 6w = 8,$$
$$4x - y - z + w = 1.$$

(20 marks)

5. Create a new MATLAB script and save it as "Q5.m". Write MATLAB codes to perform the following tasks:

   a) Evaluate the limit, $\lim_{x\to-\infty} \frac{3x^3+2x^2+x}{4x^3-5x^2+3}$. **(10 marks)**

   b) Find the 1st and 3rd derivatives of the function, $(x) = \frac{x^2-2x+1}{3x^3-5x^2+2}$. **(10 marks)**

   c) Solve the differential equation; $\frac{d^2y}{dx^2} = \cos(2x) - y$, $y(0) = 1$, $y'(0) = 1$. **(20 marks)**

   d) Evaluate the integral, $\int_0^2 \pi(2x^2 + 3x)^2 dx$. **(10 marks)**

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