M.Sc. First Semester End Examination, 2023
(Regular & Supplementary Paper)
Applied Mathematics with Oceanology and Computer Programming

PAPER-MTM-197
[COMPUTATIONAL METHODS: USING MATLAB (Practical)]

Full Marks: 25 ***Time: 02 Hrs***

The figures in the right hand margin indicate marks.
Candidates are required to give their answers in their own words as far as practicable.
Illustrate the answers wherever necessary.

Answer one question from each of the three following groups on lottery basis.

GROUP – A **(6)**

1. Write a MATLAB script to print first n terms of Fibonacci sequence.
2. Write a MATLAB script to print all palindrome numbers with in a given range.
3. Write a program in MATLAB to display the greatest prime factor of a given number.
4. Write a MATLAB script to calculate the factorial of an integer and hence find ${}^{n}C_{r}$.

5. Write a script file in MATLAB to draw a graph of $y = ax^3 + bx + c,\ 0 \le x \le 1$ mentioning title of the graph with green star marker.
6. Write a MATLAB script to solve the following set of equations

$$4x + 2y - 9z = -12$$
$$-8x - 5y + 2z = -11$$
$$6x + 7y + 3z = 16$$

   a. Using left division method.
   b. Using matrix inversion method. Also compare the results.
7. Write a script file in MATLAB to draw a graph of $y = ae^x,\ 0 \le x \le 10$ mentioning title of the graph with blue plus marker.
8. Write a MATLAB script to find the product of two polynomial $5x^4 + 6x^2 - 5x + 1$ and $9x^5 - 3x^3 + 7x^2 + 5$.

GROUP – B **(8)**

9. Write a script in MATLAB to find the value of $\int_{1.7}^{4}(3x^4 - 5x + 6)dx$ by Simpson 1/3 rule.
10. Write a script in MATLAB to solve the differential equation $\frac{dy}{dx} = x^2 + y^2; y(0) = 1$ by Euler method and find the value of $y(0.5)$.
11. Write a script file in MATLAB to find the value of $\int_a^b f(x)dx$ by trapezoidal rule.

12. Write a script in MATLAB to find the real root of the equation $x^3 - 9x + 1 = 0$by Newton-Raphson method.
13. Write a script in MATLAB to find the value of $\int_a^b f(x)dx$ by Trapezoidal rule and using this find the value of the integral $\int_0^1 \frac{1}{1+x}dx$ by dividing 200 sub-intervals.
14. Write a script in MATLAB to find the real root of the equation $f(x) = 0$ by Regular Falsi method.

GROUP – C **(6)**

15. Write an m-file to draw sin(t) and cos (t) in the interval $[-2\pi, 2\pi]$in the same figure with different line specification.
16. Plot the function $y = 3x^3 - 26x + 10$, and its first and second derivatives, for $-2 \le x \le 4$, all in the same plot.
17. Write a script file in MATLAB to draw a graph of $y = a\cos(\pi x), 0 \le x \le 1$, mentioning title of the graph red dotted line.
18. Write a script in MATLAB to draw the function $a\cos(\pi x)\, 0 \le x < 1$ mentioning label of the graph green dotted line.
19. The following data points are the daily maximum temperature (in ^{o}F) in Washington during the month of April 2002: 58 73 73 53 50 48 56 73 73 66 69 63 74 82 84 91 93 89 91 80 59 69 56 64 63 66 64 74 63 69. Write a script in MATLAB to plot histogram of this data.