Assignment 01

Third Year BS (Honors) 2019-2020

Course Title: Math Lab III (MATLAB), Course Code: AMTH 350

Department of Applied Mathematics, University of Dhaka

Name: **Roll No:** **Group:**

Solve all the following problems in MATLAB.

1. Enter the following matrix A and create

$$A = \begin{bmatrix} 1 & \cdots & 8 \\ \vdots & \ddots & \vdots \\ 33 & \cdots & 40 \end{bmatrix}$$

   (a) A 4×5 matrix B from the 1st , 3rd and 5th rows and 1st , 2nd , 4th and 8th columns of the matrix A.

   (b) 16-elements row vector C from the elements of the 5th row and the 4th and 6th columns of the matrix A.

2. Define $a \; and \; b$ as scalar $a = 0.75$ and $b = 11.3$ and x, y, z as the vectors $x = [2,5,1,9,]$, $y = [0.2, 1.1, 1.8, 2]$ and $z = [-3, 2, 5, 4]$, then evaluate

$$A_1 = \left(\frac{x^{1.1} y^{-2} \, z^5}{(a+b)^{\frac{b}{3}}} \right) + a \, \frac{(\frac{z}{x} + \frac{y}{2})}{z^a}$$

3. Solve the following system of equations

$$2x_1 + x_2 + x_3 - x_4 = 12$$
$$x_1 + 5x_2 - 5x_3 + 6x_4 = 35$$
$$-7x_1 + 3x_2 - 7x_3 - 5x_4 = 7$$
$$x_1 - 5x_2 + 2x_3 + 7x_4 = 21$$

4. Plot $\sin^2 x$, $\cos^2 x \; and \cos 2x$ on the same plot as well as subplots for $0 \leq x \leq 2\pi$, in different styles.

5. Consider the function $z = 0.56 \cos(xy)$. Draw a surface plot showing variation of z with x and y. Given $x \in [0,10] and \; y \in [0,100]$

6. Write a function to find the gradient of $f(x, y) = x^2 + y^2 - 2xy + 4$ at (a) $(1,1)$ and (b) $(1, -2)$. Use the function name from command prompt as well as from a script file.

7. Use symbolic toolbox to solve the following problems

   (a) Solve $x^7 - 8x^5 + 7x^4 + 5x^3 - 8x + 9 = 0$

   (b) Solve the ODE: $\frac{d^2x}{dt^2} + 10\frac{dx}{dt} + 5x = 11, x(0) = 1 \; x'(0) = -1$

(c) If $F(x) = x^5 - 8x^4 + 5x^3 - 7x^2 + 11x - 9$, then evaluate $F'(x)$ and $F''(x)$.

(d) $\int_0^5 \frac{dx}{0.8\,x^2+0.5\,x+2} = ?$

8. The population of X from the year 1930 to the year 2020 is given in the following table:

Year	1930	1940	1950	1960	1970	1980	1990	2000	2010	2020
Population in million	249	277	316	350	431	539	689	833	1014	1203

(a) Fit the data with a second-order polynomial. Make a plot of the points and the polynomial.

(b) Fit the data with linear and spline interpolations. Estimate the population in 1995 with linear and spline interpolations.