# Assignment 02

Third Year B.S. (Honors) 2019-2020

# Course Title: Math Lab III Course Code: AMTH 350

Department of Applied Mathematics, University of Dhaka

# Name: Roll No: Group:

*Write a MATLAB Script-M file to solve the following problem(s).*

Hydrodynamics

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| No. | Problem | Signature |
| **1.** | The velocity components of a 2-D flow are 𝑢 = (1 + 𝑦2) 𝑚/𝑠 and 𝑣 = (𝑥 − 1) 𝑚/𝑠. Determine the equation for the streamlines and graph (at least four) representative streamlines. Also indicate the direction of flow. |  |
| **2.** | Consider the velocity 𝑽 = (𝑥2 /2− 𝑥3/3) **i** + 𝑥(𝑥 − 1)(𝑦 + 1) **𝒋**, where 𝑥    and 𝑦 are in feet.   1. Is the motion possible? 2. Check whether the motion is irrotational or not. 3. Find the stagnation points (if any) |  |
| **3.** | Check whether the stream function and the velocity potential exist for the velocity field 𝑢 = 𝑎(𝑥2 − 𝑦2), 𝑣 = −2𝑎𝑥𝑦, where 𝑎 > 0. If they exist, find them. Plot some representative streamlines and equipotential curves  (at least four of each type) and interpret them. |  |
| **4.** | The velocity potential of a 2-D flow is given by 𝜙 = 𝑎𝑥3 /3− 𝑎𝑥𝑦2 − 2,  where 𝑎 > 0.   1. Plot some representative equipotential curves (at least four) 2. Determine the stream function. 3. Plot some representative streamlines (at least four). Also indicate the direction of flow in the first quadrant. |  |
| **5.** | The flowrate per unit width for a sluice gate in an open channel shown in  figure (i) is given by (𝑄 / b) 2= 𝑧2 2g(𝑧1- 𝑧2) /{1-( 𝑧2/ 𝑧1)2}.    Figure (i) Figure (ii)  Use this formula and contraction coefficient Cc= 𝑧2 /a = 0.61, whenever    1 <a/ 𝑧2< 0.2, to find the flowrate per unit width for the sluice gate shown  in figure (ii) for values of ranging from 5.0 𝑚 to 15.0 𝑚 with increment |  |

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|  | 0.25 𝑚. Take 𝑔 = 9.81 𝑚/𝑠2. Using the generated values, plot a graph  of Qb 𝑣𝑠 𝑧1 and determine whether the flowrate is directly proportional to    the flow depth. |  |
| **6.** | Consider two sources of the same strength −0.314 𝑚2/𝑠 at (0,5) and (0, −5). First, determine the stream function in Cartesian coordinates and then in polar coordinates. Plot some representative streamlines above and below the 𝑥 −axis. Do the 𝑥 and 𝑦 axes act as streamlines? If so, interpret  which one is the dividing streamline. |  |

Theory of numbers

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| 7 | Mersenne number and Fermat number are defined as respectively, calculate the numbers and separate all primes for ranges from 100 to 150, show your results in a table with headings as: “n”, “”, Prime ” ,“ “,“Prime ” |  |
| 8 | If  Where , then for any calculate the values of , and |  |
| 9 | Schedule a round-robin tournament for 8 teams so that every team plays other team exactly once. (Use the Congruence equation , where represent the teams to play at round and is the total number of teams) |  |