Complete in one class

Assignment 07

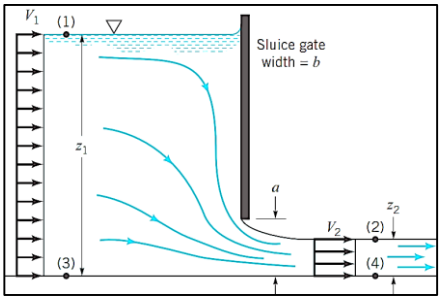
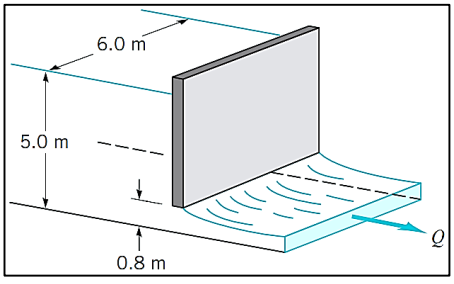
Third Year B.S. (Honors) 2017-2018

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).

No.	Problem	Signature
1.	The velocity components of a 2-D flow are $u = (1 + y^2)\ m/s$ 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 $\boldsymbol{V} = \left(\frac{1}{2}x^2 - \frac{1}{3}x^3\right)\boldsymbol{i} + x(x-1)(y+1)\,\boldsymbol{j}$, where x and y are in feet. a) Is the motion possible? b) Check whether the motion is irrotational or not. c) Find the stagnation points (if any)	
3.	Check whether the stream function and the velocity potential exist for the velocity field $u = a(x^2 - y^2), v = -2axy$, 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 $\phi = \frac{ax^3}{3} - axy^2 - 2$, where $a > 0$. a) Plot some representative equipotential curves (at least four) b) Determine the stream function. c) 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 $\frac{Q}{b} = z_2\sqrt{\frac{2g(z_1 - z_2)}{1 - \left(\frac{z_2}{z_1}\right)^2}}$.  Figure (i)  Figure (ii) Use this formula and contraction coefficient $C_c = \frac{z_2}{a} = 0.61$, whenever $1 < \frac{a}{z_1} < 0.2$, 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	

	$0.25\,m$. Take $g = 9.81\,m/s^2$. Using the generated values, plot a graph of $\frac{Q}{b}\ vs\ z_1$ and determine whether the flowrate is directly proportional to the flow depth.	
6.	Consider two sources of the same strength $-0.314\,m^2/s$ 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.	