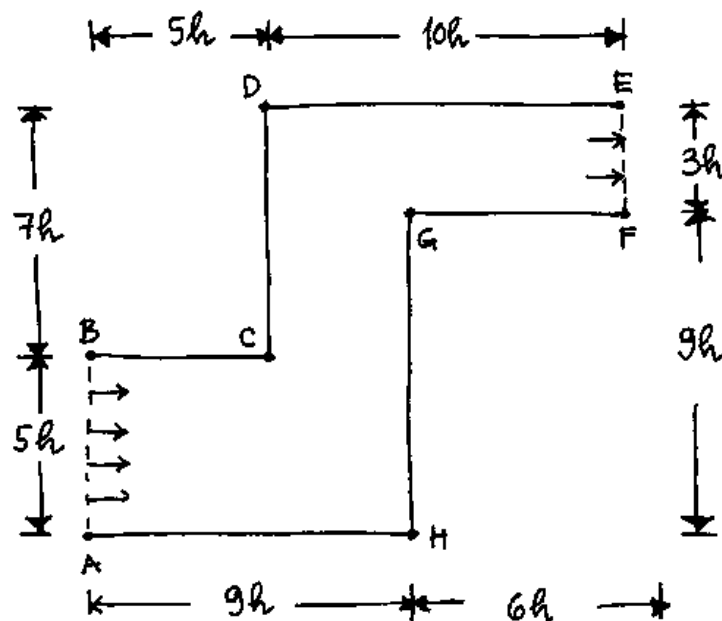


## CEE 6510 – Fall 2004 – Assignment No. 8

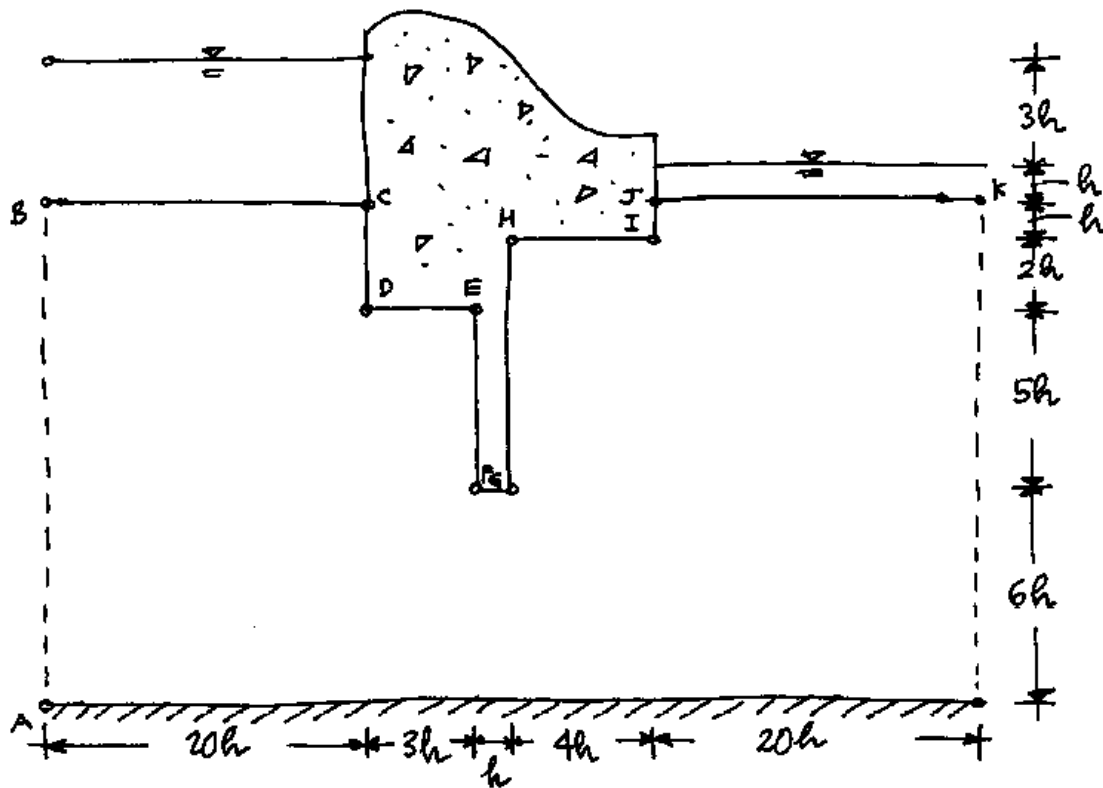
**[1] Potential flow in S-shaped domain.** Solve the Laplace equation for the streamfunction  $\psi$  in the S-shaped domain shown below. Also, solve for the velocities at the grid points. Plot the grid, the streamlines, and the velocity vectors. Determine and plot the pressure distribution along walls  $BCDE$  and  $AHGF$ .

Water enters the domain through section  $AB$  with a constant velocity  $U = 2.5 \text{ m/s}$ . Let  $h = 1 \text{ m}$ . Use as boundary conditions,  $\psi = 0$  along  $AHGF$ , and  $\psi = 5hU$  along  $BCDE$ . Also, use the fact that the vertical velocity is zero in sections  $AB$  and  $EF$ . Solve the problem using (a)  $\Delta x = \Delta y = 1 \text{ m}$ ; (b)  $\Delta x = \Delta y = 0.5 \text{ m}$ ; and (c)  $\Delta x = \Delta y = 0.25 \text{ m}$ .



**[2] Flow under a dam.**

The figure in next page shows an unconfined aquifer underlined by a horizontal impermeable bed, and open in the left and right-hand ends of the domain. A dam is located atop of the aquifer and a thick cut-off wall provided under the dam. Solve the Laplace equation for the velocity potential  $\phi$ , then calculate the velocity components in the grid points, and the pressure distribution along the bottom of the dam, the cut-off wall, and the bottom of the aquifer. Plot contours of  $\phi$  and velocity vectors. Calculate the discharge under the cut-off wall. Assume that the velocity at the left and right-hand sides of the aquifer is horizontal. Use  $h = 0.5 \text{ m}$ , and try the following cases: (a)  $\Delta x = \Delta y = 1 \text{ m}$ ; (b)  $\Delta x = \Delta y = 0.5 \text{ m}$ ; and (c)  $\Delta x = \Delta y = 0.25 \text{ m}$ .



**Submit:**

- Word document showing problem statement, functions or scripts used to solve problem, and output showing solution. Include your name in this document.
- M-files with Matlab scripts and functions.
- Input or output text files.

**How to submit your assignment:**

Place the Word document, *m*-files, and input and output text files in a zip file. E-mail the zip file to: [gurro@cc.usu.edu](mailto:gurro@cc.usu.edu)