

BIE 5300/6300 Assignment #2 Current Metering Calculations

09 Sep 04 (due 14 Sep 04)

Show your calculations in an organized and neat format. Indicate any assumptions or relevant comments.

- I. You are given the electromagnetic current metering measurements below. Calculate the total flow rate in the channel using a spreadsheet. Plot the cross-section profile in a graph.

Distance (m)	Depth (m)	Depth Fraction	Velocity (m/s)			Average depth (m)	Width (m)	Area (m ²)	Flow (m ³ /s)
			At point	mean at vertical	subsection mean				
Left									
0.000	0.00		0.25						
0.305	0.58	0.2	0.51						
		0.8	0.46						
0.615	0.58	0.2	0.54						
		0.8	0.46						
0.925	0.58	0.2	0.49						
		0.8	0.43						
1.230	0.00		0.25						
Right						Totals:			

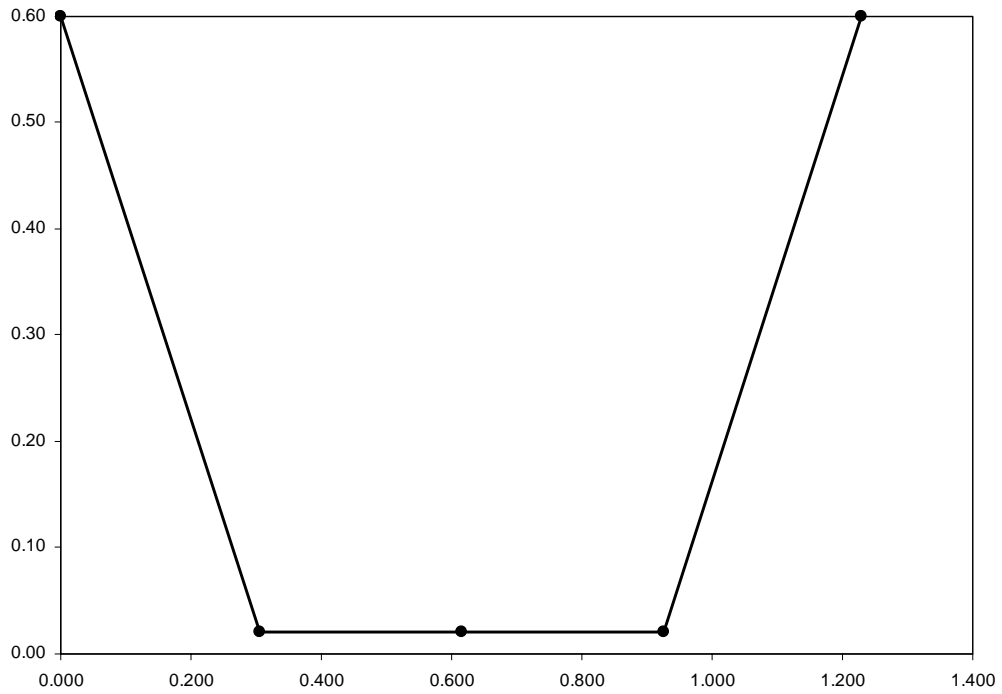
- II. You are given the electromagnetic current metering measurements below. Calculate the total flow rate in the channel using a spreadsheet. Plot the cross-section profile in a graph.

Distance (m)	Depth (m)	Depth Fraction	Velocity (m/s)			Average Depth (m)	Width (m)	Area (m ²)	Flow (m ³ /s)
			At point	mean at vertical	subsection mean				
Left									
0.00	0.500								
0.16	0.500	0.2	1.40						
		0.8	1.51						
0.32	0.500	0.2	1.85						
		0.8	1.45						
0.48	0.500	0.2	1.96						
		0.8	1.50						
0.64	0.500	0.2	1.94						
		0.8	1.56						
0.80	0.500	0.2	1.62						
		0.8	1.46						
0.96	0.500								
Right						Totals:			

Solutions:

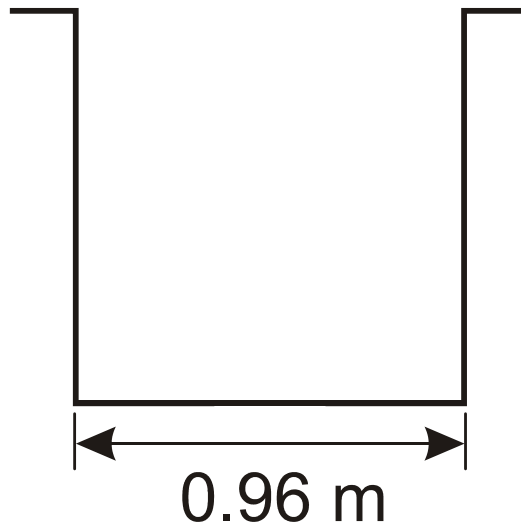
I. The calculations were performed in a spreadsheet and the results are:

Distance (m)	Depth (m)	Depth Fraction	Velocity (m/s)			Average depth (m)	Width (m)	Area (m ²)	Flow (m ³ /s)
			At point	mean at vertical	subsection mean				
Left									
0.000	0.00		0.25	0.250					
					0.368	0.290	0.305	0.088	0.033
0.305	0.58	0.2	0.51	0.485					
		0.8	0.46		0.493	0.580	0.310	0.180	0.089
0.615	0.58	0.2	0.54	0.500					
		0.8	0.46		0.480	0.580	0.310	0.180	0.086
0.925	0.58	0.2	0.49	0.460					
		0.8	0.43		0.355	0.290	0.305	0.088	0.031
1.230	0.00		0.25	0.250					
Right						Totals:	1.230	0.537	0.239



II. Again, the calculations were performed in a spreadsheet, applying the algorithm for vertical walls (see the lecture notes), and the results are:

Distance	Depth	Depth Fraction	Velocity (m/s)			Average Depth	Width	Area	Flow	
			At point	mean at vertical	subsection mean					
(m)	(m)					(m)	(m)	(m ²)	(m ³ /s)	
Left		$x/D=$	0.32							
0.00	0.500	$Vx/VD=$	0.92	1.03						
					1.24	0.500	0.16	0.080	0.099	
0.16	0.500	0.2	1.40	1.46						
		0.8	1.51		1.55	0.500	0.16	0.080	0.124	
0.32	0.500	0.2	1.85	1.65						
		0.8	1.45		1.69	0.500	0.16	0.080	0.135	
0.48	0.500	0.2	1.96	1.73						
		0.8	1.50		1.74	0.500	0.16	0.080	0.139	
0.64	0.500	0.2	1.94	1.75						
		0.8	1.56		1.65	0.500	0.16	0.080	0.132	
0.80	0.500	0.2	1.62	1.54						
		0.8	1.46		1.31	0.500	0.16	0.080	0.105	
0.96	0.500	$x/D=$	0.32	1.09						
Right		$Vx/VD=$	0.92							
Totals:							0.960	0.480	0.735	



Note: Never show open-channel current metering results with more than two or three significant digits – four or more significant digits cannot be justified.