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White Edition: 4th Publishers: Tata McGraw Hill Education ISBN: XXX Pages: 1023 Chapters: 11 Files Type: PDF File size: 13 MB Content: Introductory pressure Distribution in a fluid Integral relations for a volume of differential relations control for A particle of fluid dimensional analysis and similar to the viscous flow in past flow ducts of the past placed organisms fluid and fluid dynamic compromise compromixable flow flux open channel flow of open channel flow of the open channel open channel appendage of fluids appendix B tables Compression Flow Appendix C Conversion Factor Appendix D Equations of Movimen To the cylindrical appendix and introduction to EES answers to the selected problems The seventh edition of the mechanics of white fluids offers students a clear and complete presentation of the material that demonstrates the progression of physical concepts to engineering applications and help students quickly s and l 'practical importance of fundamentals of fluid mechanics. The wide variety of arguments gives the instructors many options for their course and is a useful resource for long students after graduation. The unique-resolution approach of the book problems is presented at the beginning of the book and carefully integrated into all examples. Students can progress from general ones to those concerning the design, more passages and use of the computer. Download the fluid mechanics seventh edition of Frank M. White easily in PDF format for free. Download you want more? Advanced incorporation details, examples and help! Chapter 3 Integral reports for a volume of control P3.1 Discussing Newton Second Law (the linear momentum report) in these three forms: () Systemd DM MDT DTD VFV Vsolution: These questions are just to make students think of the laws of Mechanical base. They are valid and equivalent for constant mass systems and we can use them all in some problems of fluids, eg. The # 1 form for small elements, module # 2 for rocket propulsion, but the # 3 module is the volume of adjusted control and therefore the most popular in this chapter. P3.2 Consider the relationship of the angular imagination in the module () osystemdddt m r v What does R in this relationship? Is this relationship valid both in solid and fluid mechanics? It is related to the equation (PROB. 3.1)? How? Solution: These questions are just to get students think about a corner moment than the linear momentum. One could forget that R is the position vector from the moment-center to the elements D where the momentum is added. Perhaps RO is a better notation. P3.3 for fixed laminated flow through a long tube (see Prob. 1.12), axial axial speed It is given by U C (R2 R2), where R is the outer radius of the tube and there is a constant. Integra U (R) to find the total volume flow Q via the tube. Solution: the area element for this assized flow is 2 r dr. From EQ. (3.7), 2 20 () 2Q u from c r rr rd dr ans 4cr2 .r Chapter 3 Integral reports for a control volume 177 p3.4 A fire pipe has a 5-inch internal diameter and flows to 600 gal / min . The flow comes out through a decline of the nozzle to a diameter DN. For constant flow, what should DN be in inches to create a 25 m / s output speed? Solution: This is a problem of continuity of the constant single dimensional flow. Some unit conversions are required: 600 gal / min = 1,337 ft3 / s; 25 m / s = 82.02 ft / s; 5 inches = 0.4167 ft The flexible hose diameter (5 in) would establish an average speed of the 9.8 ft / s tube, but we don't really need this. Go directly to the volume flow. 144.0Fores.) 02.82 (4337.1 223ansfddsdtdvasftq nnnn in1.73 p3.5 water at 20c flows through a smooth tube of 5-inch diameter to a number of highly number reynolds, for which it is Given the speed profile of speed u u (y / r) 1/8, where the uo is the speed of the central line, r is the radius of the tube, and y is the distance measured by the wall to the line Central. If the central line speed is 25 ft / s, estimate the volume carried in gallons per minute per minute. Solution: the average speed speed formula in this case has been provided in Example 3.4: 321 / 8 1/82 2 0.837 0.837 (25) 20.92 (1) (2) (1) (2) 2.5 [20.92] () 2.85 .12av oo oo oav pipeftv uu um mft ft galthus qva ft anss s min 1280s mini solutions 1280S Manual Mechanics Manual Solutions, Fifth Edition 178 P3.6 When a liquid jet to gravity emitted by a slot in a tank, as in Fig. P3.6, an approximation for the distribution of The output speed is 2 (), Ughz where H is the depth of the central line of the jet. Close to the slot, the jet is horizontal, two-dimensional, 2L thick ND, as shown. Find a general expression for the total volume flow D that releases from the slot; So take the limit of your result if .l h fig. P3.6 Solution: Let the width of the slot is B in the paper. Then the volume flow from EQ. (3.7) $\dot{A} + L1 / 2LQ UDA [2G (Hz)] BDZ$. At 3/2 3/22b (2g) [(hl) (hl)] 3 In the limit of this formula reduces chapter 3 integral reports for a control volume 179p3.8 three tubes constantly delivery water to 20c to a large tube output in fig. P3.8. The V2 5 m / s speed and the q4 120 m3 / h output flow rate. Find (A) V1; (b) V3; and (c) V4 if it is known that the increase of the 20% Q3 would increase the 10% Q4. Solution: (a) For constant flow we have Q1 + Q2 + Q3 Q4 or fig. P3.8 1 1 2 2 3 3 4 4 V Avavava (1) from 0.2Q3 0.1q4 and Q4 (120 m3 / h) (1 h / 3600 s) 0.0333 m3 / s. 3ns.4323 (0.0333 m / s) (0.0333 m / s) (b) 2 (0.06) 2QV AA 5.89 m / s Replacing in (1), 2 2 21 (0.04) (5) (0.05) (5.89) (0.06) 0.0333 (a) 4 4 4 V at 1V 5.45 m / s ns. From mass preservation, Q4 V4A4 3 24 (0.0333 m / s) V () (0.06) / 4 (c) ANS. 4V 5.24 m / s). () 35.0) (6 / () 35.0) () 005.0) (4 /)[() 5.2 (325TANK BANSMSMMMKGDTDSKG / M0.793 Manual FLUID Mechanical Manual, Fifth Edition 180 P3.9 A laboratory test tank Contains Salon sea water if density. The water enters the tank on conditions (S1, l, A1, V1) and is assumed that it immediately mixed in the tank. Water of the tank leaves through an A2 socket at Velocity V2. If the salt It is a conservative property (NA @ created NA @ destroyed), use the Reynolds transport theorem to find an expression for the rate of variation of the mass of nsalt salt inside the tank. Solution: by definition, salinity s Sale /. Because the salt is a conservative substance (not consumed or in this problem), the appropriate control volume report is 2 1saltsystem s 1CVDMM DD SM S MDT DT DT 0 or: ANS.S CV 1 1 1 1 2 2 2DM Savava VDT 3.10 The water flowing through a tube of Diameter from 8 cm enter a porous section, as in fig. P3.10, which allows a VW uniform radial speed through the surfaces of the wall for a distance of 1.2 m. If the AVE Rage Velocity V1 entry is 12 m / s, find the v2 output speed if (a) vw 15 cm / s from the walls of the tube; (B) VW 10 cm / s in the tube. tube. What value of VW will do V2 9 m / s? Fig. P3.10 SOLUTION: (a) For a VW 0.15 m / s aspiration speed, and a suction cylindrical surface, 22wa 2 (0.04) (1.2) 0 016 m .31 WQ QQ 2 22 (12) () (0.08) / 4 (0.15) (0.3016) V () (0.08) / 4 (a) ANS. 2V 3 m / s Chapter 3 Integral reports for a volume control 181 (B) For an injection speed in the tube, VW 0.10 m / s, Q1 + QW = Q2, or: 2 22 (12) () (0.08) / 4 (0.10) (0.3016) V () (0.08) / 4 (b) ANS. 2V = 18 m / s (c) V2 outflow setting at 9 m / s, wall suction speed is, 2 2W (12) () (0.08) / 4 (V) (0.3016) (9) () (0.08) / 4 WV 0.05 m / s 5 cm / s on p3.11 The inlet section of a vacuum cleaner is a 5-inch 1-inch rectangle. The fan is able to provide suction to 25 feet cubes per minute. (A) What is the average incoming speed, in m / s? (B) If the conditions are standard above sea level, what is the mass flow of air, in kg / s? Solution: (a) Convert 25 ft3 / min to 25/60 = 0.417 ft3 / s. Then the input speed is 30.417 / 12.0 0.3048. () (1/12) (5/12) InletFT input MS MV AA FT FT FT S S 3.66 m NS A (B) at sea level, air = 1.2255 kg / m3. Convert 25 ft3 / min to 0.0118 m3 / s. Then 33 (1.2255) (0.0118). () Air AIRKG M KGMM ANS SM 0.0145 S B

encloses the tank and portion of the tube under the tank. 0OUT INDDV M MDT 2 () () on INDHRAV AVDT 0 24 998 (0.12) (2.5 1.9) 0.0153 /, MS DH 2 4998 () (0.75) 0.7 / 0.0153DTANS.TS 46 Chapter 3 Integral reports For a volume control 183P3.13 The cylindrical container in Fig. P3.13 D Fig. P3.13H (T) is of 20 cm in diameter and has a conical contraction inferiorly a 3 cm output hole in diameter. The tank contains fresh water at standard sea level conditions. If the surface of the water drops to the almost constant / dt 0.072 m / s speed, estimate the average v speed from the lower exit. V? Solution: We could simply note that DH / DT is the same as water speed on the surface and use Q1 = Q2, or, more instructive, approaches as a volume control problem. Allow the control volume comprising the entire container. Then the mass report)] 072.0 (l) 320 (: datatheintroduces) () (: 4cancel044: . For incompressible flow, (a) derive an analytical expression for DH / DT in terms of (Q1, Q2, Q3). (b) If h is constant, they determine V2 for data if V1 = 3 m / se q3 0 , 01 m3. / S solution: (.) $\dot{A}$ ϵ

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