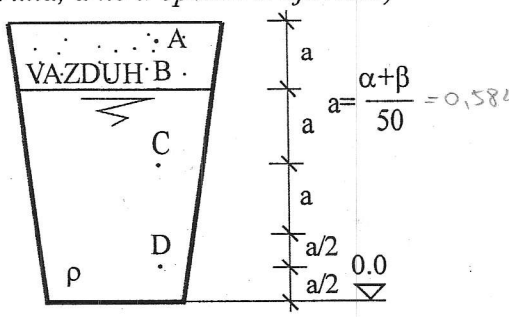
JEDNOSTAVNI ZADACI

ZADATAK 1.1

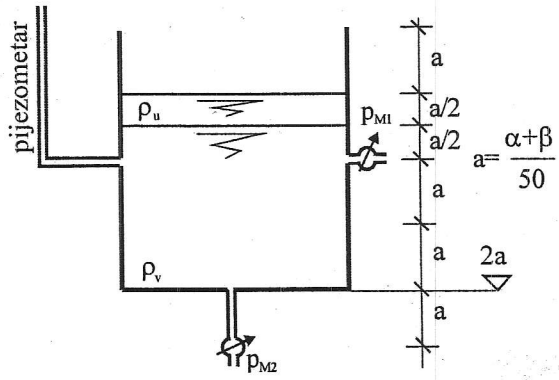
(Napomena: slike kotirati u metrima, a ne u opštim brojevima)

Rezervoar kao na slici je napunjen tečnošću gustine $\rho=4a/3$ kg/dm^3. Iznad površine fluida nalazi se vazduh pod pritiskom od $p_{vaz}=-\beta/2$ kPa. Izračunati pijezometarsku kotu fluida i hidrostatičke i apsolutne pritiske u naznačenim tačkama A, B, C i D. Gustina vazduha se zanemaruje.



ZADATAK 1.2

U rezervoaru prikazanom na slici se nalazi ulje gustine $\rho_u=0.8$ kg/dm^3 i voda gustine $\rho_v=1.0$ kg/dm^3. Izračunati pijezometarske kote fluida, naznačiti nivo u pijezometru i izračunati pritiske koje pokazuju manometri.

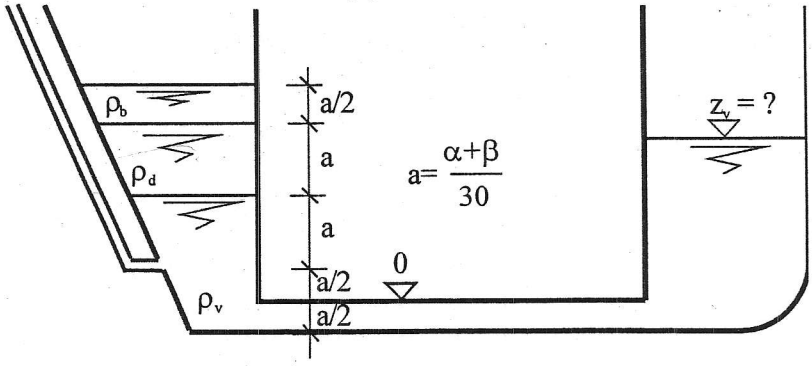


SLOŽENI ZADACI

ZADATAK 1.3

U rezervoaru kao na slici se nalaze tri fluida: benzin (gustine $\rho_b=0.74$ kg/dm^3), dizel ($\rho_d=0.83$ kg/dm^3) i voda ($\rho_v=1.0$ kg/dm^3). Izračunati:

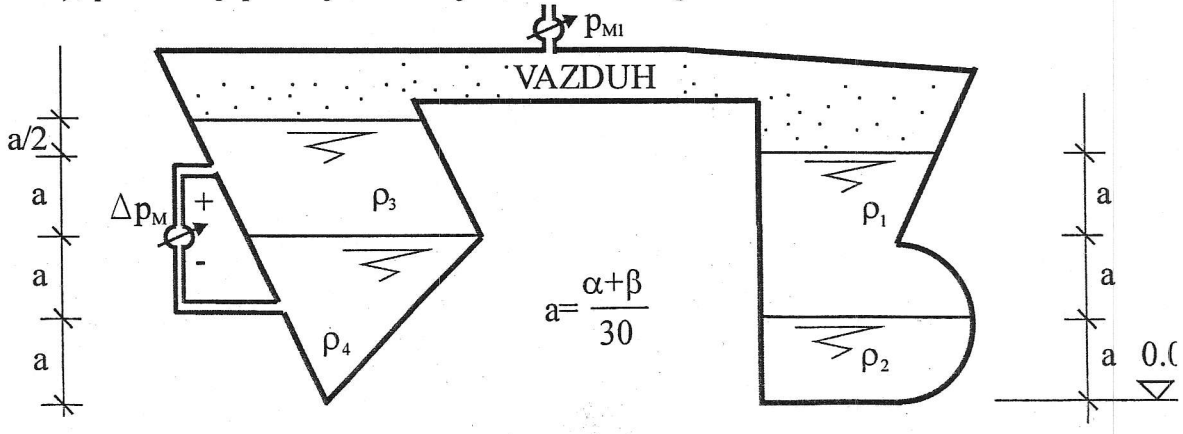
a) Pijezometarske kote fluida,
b) Nivo vode u desnom delu rezervoara i nivo u pijezometru sa leve strane (naznačiti na pijezometru nivo)



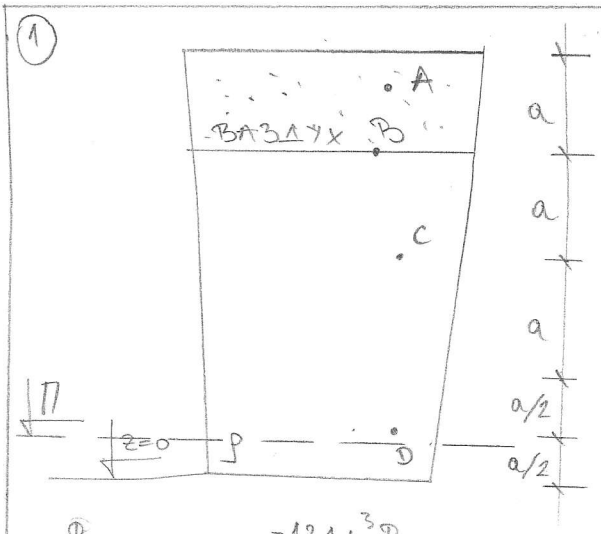
ZADATAK 1.4

U instalaciji kao na slici, nalaze se četiri fluida i vazduh pod pritiskom. Gustine fluida su $\rho_1=1-\beta/200$ kg/dm^3, $\rho_2=1.2$ kg/dm^3 , $\rho_3=1-\beta/300$ kg/dm^3 i $\rho_4=\rho_2$ dok se gustina vazduha zanemaruje. Ako manometar M1 pokazuje, $p_{M1}=0.5$ bara, izračunati:

a) Pijezometarske kote fluida,
b) pritisak koji pokazuje diferencijalni manometar Δp_M.



①



$\alpha = 5 \quad \beta = 24.2 \quad \Pi = ?$

$a = \frac{\alpha+\beta}{50} = 0,584\ m \quad p_{aps}, p = ?$

$\rho = \frac{4a}{3} = 0,779\ kg/dm^3$

$p_{vaz} = -\frac{\beta}{2} = -12,1\ kPa$

$\frac{p}{\rho g} + z = \Pi$

$\Pi = \frac{p_{vaz}}{\rho g} + z_B = \frac{-12,1 \cdot 10^3\ Pa}{9,81 \frac{m}{s^2} \cdot 0,779 \cdot 10^3 \frac{kg}{m^3}} + 3 \cdot 0,584 \Rightarrow \boxed{\Pi = 0,169\ m}$

$\boxed{p_A = p_{VAZ} = p_B = -12,1\ kPa} \quad p_{aps(A,B)} = p + p_{atm} = -12,1 + 100 \Rightarrow \boxed{p_{aps(A,B)} = 87,9\ kPa}$

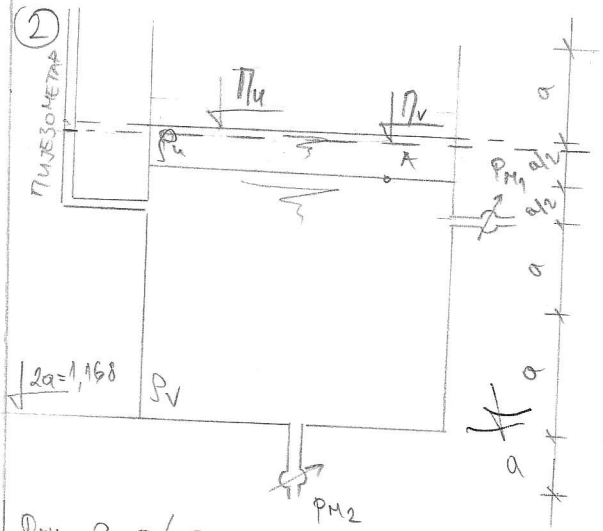
$p_C = \rho g (\Pi - z_C) = 0,779 \cdot 10^3 \frac{kg}{m^3} \cdot 9,81 \frac{m}{s^2} \cdot (0,169\ m - 2 \cdot 0,584)$

$\boxed{p_C = -7,634\ kPa} \quad p_{aps(C)} = -7,634 + 100 \Rightarrow \boxed{p_{aps(C)} = 92,37\ kPa}$

$p_D = \rho g (\Pi - z_D) = 0,779 \cdot 10^3 \frac{kg}{m^3} \cdot 9,81 \frac{m}{s^2} \cdot (0,169\ m - 0,584/2)$

$\boxed{p_D = -0,939\ kPa} \quad p_{aps(D)} = 100 - 0,939 \Rightarrow \boxed{p_{aps(D)} = 99,06\ kPa}$

②



$\rho_u = 0,8\ kg/dm^3 \quad \Pi_u = ? \quad p_{M_1} = ?$

$\rho_v = 1,0\ kg/dm^3 \quad \Pi_v = ? \quad p_{M_2} = ?$

$\boxed{\Pi_u = 2,92\ m}$

$\frac{p_A}{\rho_u g} + z_A = \Pi_u \Rightarrow p_A = \rho_u g (\Pi_u - z_A)$

$p_A = 0,8 \cdot 10^3 \cdot 9,81 (2,92 - 2,628)$

$\boxed{p_A = 2,29\ kPa}$

$\Pi_V = \frac{p_A}{\rho_v g} + z_A = \frac{2,29 \cdot 10^3}{1000 \cdot 9,81} + 2,628$

$\boxed{\Pi_v = 2,861\ m}$

$p_{M_2} = \rho_v g (\Pi_v - z_{M_2})$

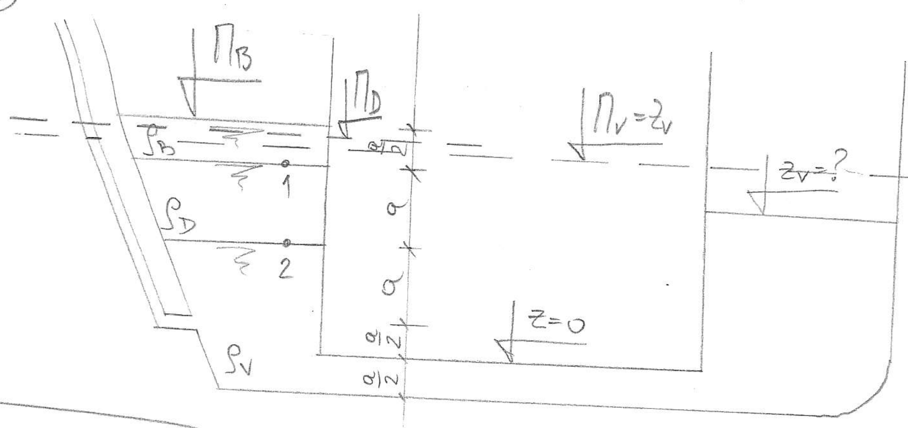
$p_{M_2} = 1000 \cdot 9,81 (2,861 + 0,584)$

$\boxed{p_{M_2} = 22,34\ kPa}$

$p_{M_1} = 1000 \cdot 9,81 (2,861 - 2,336)$

$\boxed{p_{M_1} = 5,15\ kPa}$

1.3



$\rho_B = 0{,}74\ kg/dm^3$

$\rho_D = 0{,}83\ kg/dm^3$

$\rho_V = 1{,}0\ kg/dm^3$

$\Pi_B, \Pi_D, \Pi_V = ?$

$z_V = ?$ $\quad \alpha = 5 \quad \beta = 24{,}2$

$a = \frac{\alpha + \beta}{30} = 0{,}973\,m$

$\boxed{\Pi_B = 2{,}92\,m}$

$p_1 = \rho_B g (\Pi_B - z_1)$

$p_1 = 0{,}74 \cdot 10^3 \cdot 9{,}81 (2{,}92 - 2{,}432)$

$\boxed{p_1 = 3{,}54\,kPa}$

$\Pi_D = \frac{p_1}{\rho_D g} + z_1$

$\Pi_D = \frac{3{,}54\,kPa}{0{,}83 \cdot 10^3 \cdot 9{,}81} + 2{,}432 \Rightarrow$

$\boxed{\Pi_D = 2{,}867\,m}$

$p_2 = \rho_D g (\Pi_D - z_2)$

$p_2 = 830 \cdot 9{,}81 (2{,}867 - 1{,}459)$

$\boxed{p_2 = 11{,}46\,kPa}$

$\Pi_V = \frac{p_2}{\rho_V g} + z_2$

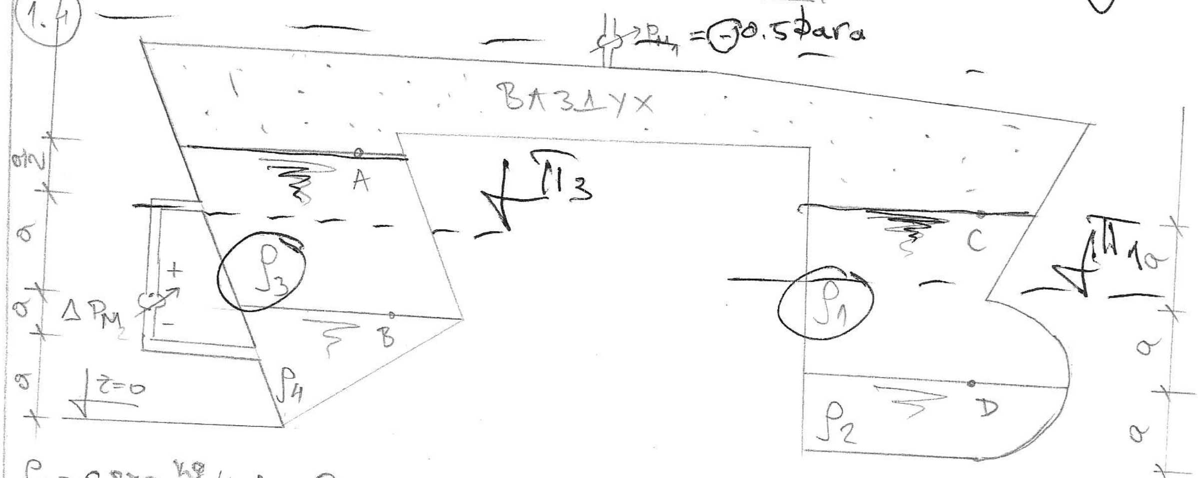
$\Pi_V = \frac{11{,}46 \cdot 10^3}{1000 \cdot 9{,}81} + 1{,}459$

$\boxed{\Pi_V = 2{,}627\,m}$

$z_V = \Pi_V \Rightarrow$

$\boxed{z_V = 2{,}627\,m}$ ✓

1.4



$\rho_1 = 0{,}879\ kg/dm^3$ $\quad p_{M_1} = 0{,}5\ bara = 50\,kPa$ $\quad a = 0{,}973\,m$

$\rho_2 = 1{,}2\ kg/dm^3$ $\quad \Pi_1, \Pi_2, \Pi_3, \Pi_4 = ?$

$\rho_3 = 0{,}919\ kg/dm^3$ $\quad \Delta p_M = ?$

$\rho_4 = 1{,}2\ kg/dm^3$

$\Pi_3 = \frac{p_{M_1}}{\rho_3 g} + z_A = \frac{50 \cdot 10^3}{0{,}919 \cdot 10^3 \cdot 9{,}81} + 3{,}31 =$

$\boxed{\Pi_3 = 8{,}951\,m}$

$\Pi_1 = \frac{p_{M_1}}{\rho_1 g} + z_C = \frac{50 \cdot 10^3}{879 \cdot 9{,}81} + 2{,}919 =$

$\boxed{\Pi_1 = 8{,}717\,m}$

$p_B = \rho_3 g (\Pi_3 - z_B) = 0{,}919 \cdot 10^3 \cdot 9{,}81 (8{,}951 - 1{,}946)$

$\boxed{p_B = 63{,}15\,kPa}$

$p_D = \rho_1 g (\Pi_1 - z_D) = 0{,}879 \cdot 10^3 \cdot 9{,}81 \cdot (8{,}717 - 0{,}973)$

$\boxed{p_D = 66{,}77\,kPa}$

$\Pi_4 = \frac{p_B}{\rho_4 g} + z_B = \frac{63{,}15 \cdot 10^3}{1{,}2 \cdot 10^3 \cdot 9{,}81} + 1{,}946$

$\boxed{\Pi_4 = 7{,}310\,m}$

$\Pi_2 = \frac{66{,}77 \cdot 10^3}{1{,}2 \cdot 10^3 \cdot 9{,}81} + 0{,}973 \Rightarrow$ $\boxed{\Pi_2 = 6{,}645\,m}$

ГРЕШКА У ЗАОКРУЖИВАЊУ $\Delta p_M = 0$

$\boxed{\Delta p_M = 7{,}80\,Pa}$