URBAN INFRASTRUCTURE HYDRAULIC SYSTEMS
ASSIGNMENT 1

DEADLINE FOR THE ASSIGNMENT 1 IS THE DAY OF MIDTERM 1.

Student ID	060410**ba**
b or/and **a** is 0 take **5**	

Problem 1: A 0.8m diameter well in a homogeneous unconfined aquifer as shown in the Figure;

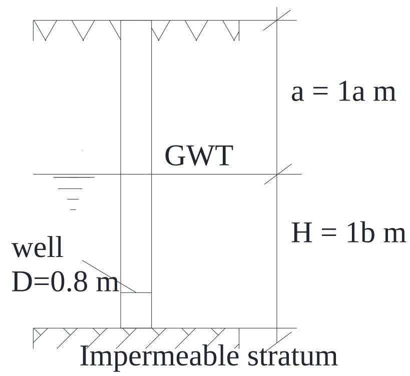
a) Determine the optimum discharge.

b) Determine the population which will be supplied from this well. (Meanq_{day}= 100 l/ind./day)

c) Draw schematic view of the well and show the locations of engine and pump on the Figure.

d) Determine the diameter of the well if the well designed as caisson. Assume well is only supplied from the sides.

(k= 0.005m/s)

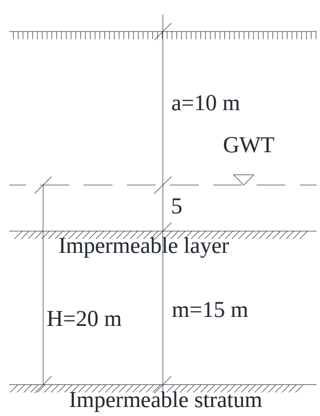


Problem 2: A well-used for the water demand of a population in a homogeneous confined aquifer is as shown in the Figure. Sieve analysis results are given as d_{10}= 0.2mm, d_{60}= 0.6mm, d_{80}= 1.8mm, d_{90}= 2.0mm for the impermable stratum material.

a) Determine the optimum discharge. (d=1.00m)

b) Determine the population feed from this well. (Meanq_{day}= 160 l/ind./day)

c) Design the filter layer and pipe placed in the well.



Problem 3: Water transmission line will be supplied water demand of a population as seen in Figure. Populations according to years are given as; N_{1995}=7000, N_{2005}=16000. Minimum allowable pressure of network, $(\frac{P}{\gamma})_{min.network} = 5$ wmc, Mean daily consumption is $Meanq_{day}$=9a l/ind/day, water level in catchwork is 8a m, the pump works 1a hour a day, J=(0,017/D).(V^2/2g), electricty consumption=0,20 TL/kwh, Interest+depreciation=%15, efficiency of the pump is η= %85.

Diameter (mm)	200	250	300	400	500
Cost (TL/m)	50	70	90	150	270

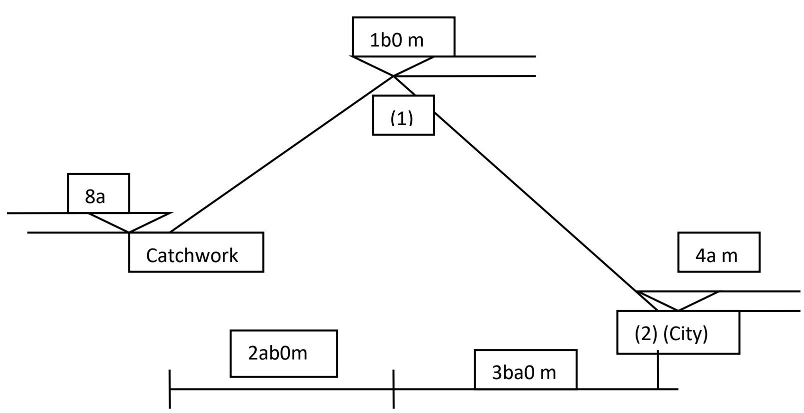
a) Determine the population of city in 2035,

b) Determine the diameter of water transmission line (WTL) and the diameter of the network master pipe.

c) Determine the power of the pump.

d) Determine the static and operating pressure at point 1 and in catchwork.

$$A = P.\frac{p}{100} + \frac{Q_T.J.b.E}{102.\eta}$$



Problem 4: Maximum allowable pressure in WTL as seen in Figure is 150 m,

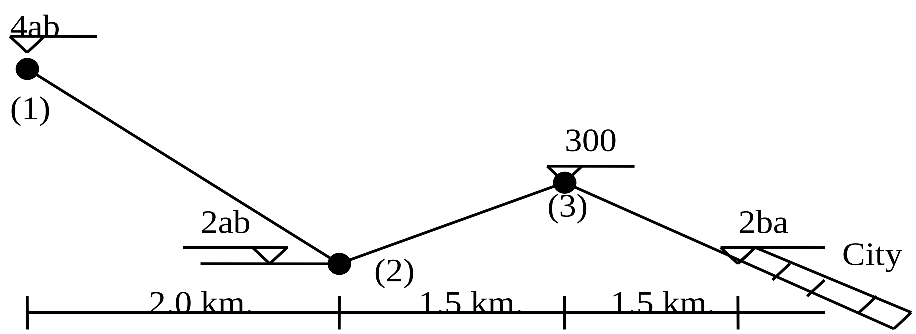
a-) Draw the piezometric grade line and show the necessary components of WTL on Figure.

b-) Determine the location of water tank. (The head loss of the master pipe of network is 3m and the depth of the water in tank is 5m.)

c-) Determine the diameter of WTL which will be supplied of the city for population, P=1ab000. (Standart diameters: 300, 400, 500, 600, 700, 800, 900 ve 1000 mm).

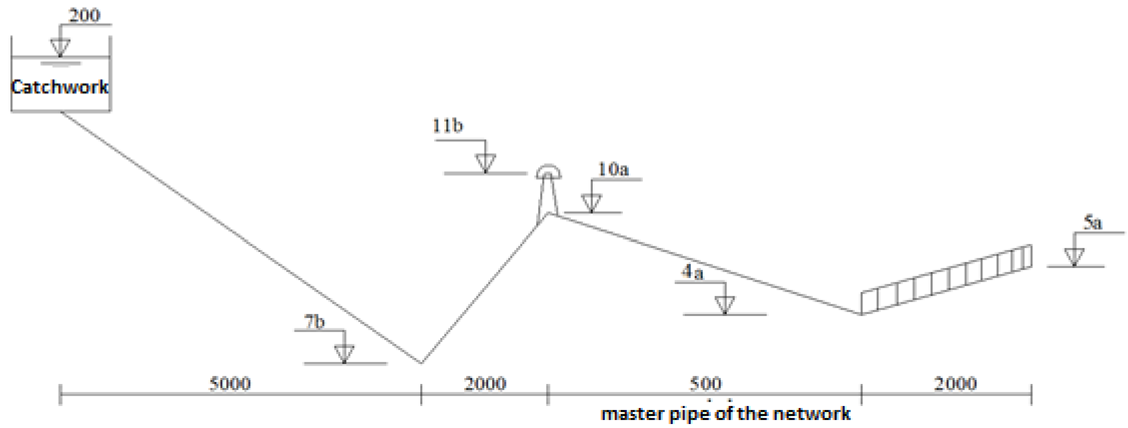
d-)Determine the static and operating pressure at point 2 and 3.

$$(Meanq_{day} = 1balt/ind./day\ ,\quad (\frac{P}{\gamma})_{\min,WDN} = 30m\ ,\quad \lambda=0.02\ ,\quad (\frac{P}{\gamma})_{\min,WTL} = 30m)$$

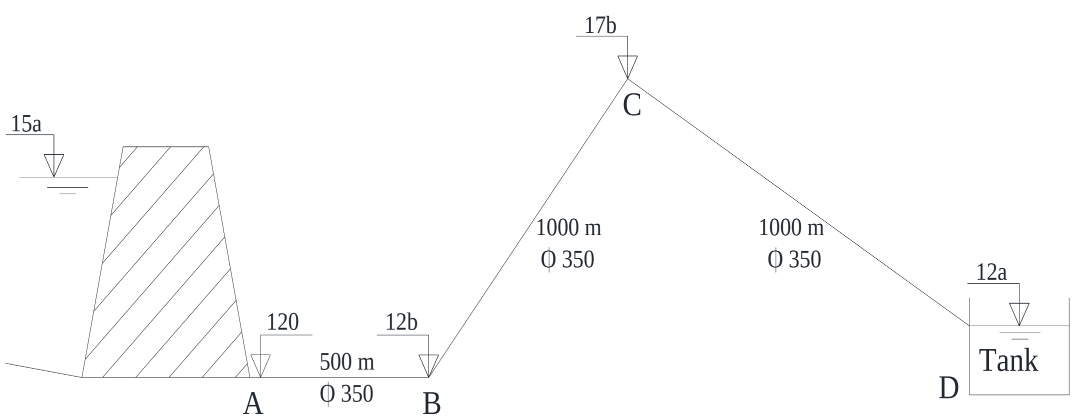


Problem 5: The WTL was constructed to supply the water demand of city of population, P= 4ab00. The diameter of The WTL is 500 mm. Meanq$_{day}$ = 1ba lt/ind./day, minimum pressure of the network is 25m, maximum allowable pressure of WTL and WDN is 80 m. The entrance pressure of water tank which is located at the elevation of 120m is 3m. If William –Hazen coefficient, C is 120, determine;

a) The discharge of the WTL
b) The discharge of master pipe of the network.
c) The location of the pressure reducing chamber (PRC).
d) Draw the piezometric grade line on Figure.



Problem 6: : A city population in years 2000 and 2005 is 1ab00 and 2ab00, respectively. Water demand will be supplied from dam reservoir. Meanq_{day} = 1ba lt/ind./day, minumum pressure of WTL is 4m, maxiumum allowable presure is 100m. The WTL was constructed by using steel pipes. Accordind to ILBANK, pump was placed to supply to water demad of population in 2040. Determine the power of the pump and draw the piezometric grade line. (William-Hazen coefficient, C=110, $V=0,85CR^{0.63}J^{0.54}$)



Problem 7: Total water consumption of a town during a day is given Table with the referance to consumption as percentage.

a) if WTL works due to the force of gravity only,

b) if there is a pump is working between 08:00-20:00 on WTL,

Determine the reservoir volume in both analytical and graphical ways. (Population=2ab00, $maxq_{day}$=1ba lt/ind./day)

Time (o'clock)	0-4	4-8	8-12	12-16	16-20	20-24
Consumption %	9	11	20	30	20	10

Problem 8:) A city population in years 1995 and 2005 is 14000 and 23000, respectively. The diameter of WTL is 500mm.($Meanq_{day}$100 l/ind./day , λ =0.02 ve sabit alınacaktır). Buna göre;

a) Determine the population of the town in 2038 and evalute the water demand.

b) Show the usefull components of WTL on Figure.

c) Determine the power of the pump if the pump is working 12 hours and suction head loss is 3m. (η=0.70, $N=\dfrac{\gamma . Q_T . H}{102.\eta}$ (kW)).

d) Determine the static and operating pressures at points (1), (2), (3) , (4) and piezometric grade line elavations at points (1), (2), (3) , (4).