EXPERIMENT-5

PROBLEMS BASED ON STEADY STATE RADIAL FLOW IN A CONFINED AQUIFER

QUESTION 1:

A 10cm well penetrates a 10m thick confined aquifer. The steady state drawdaon were found to be 2.5 and 0.05m at distance of 10m and 40m, respectively. from the center of the well. When the well was operated with a constant discharge rate of 125 l/min for 12R. Using Dupuit - Theim equation, calculate the transmissibility and hydraulic conductivity.

SOLUTION:

$Q = 125\ l/min = 0.125\ m^3/min$

$r_1 = 10m$

$r_2 = 40m$

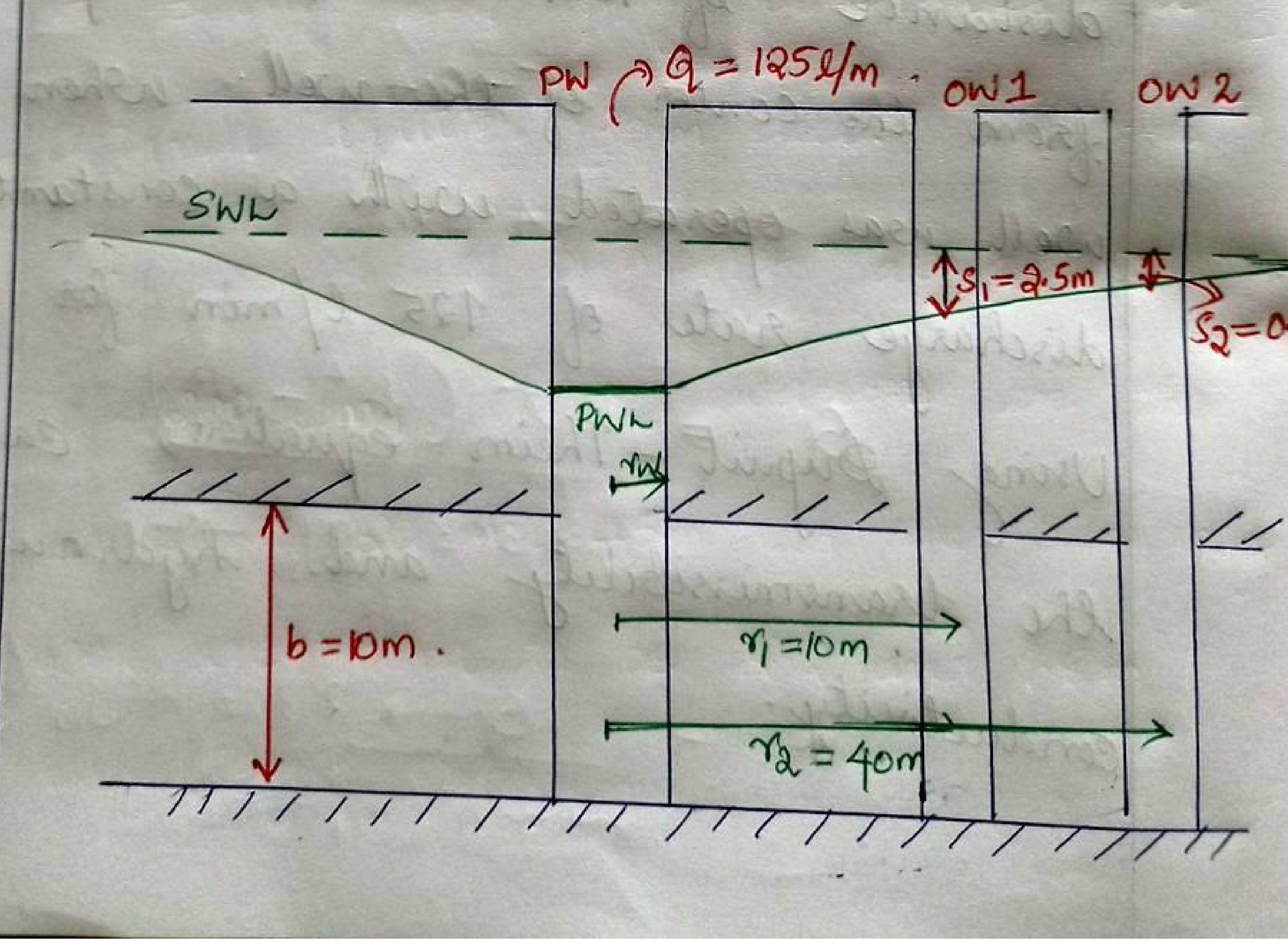
$s_1 = 2.5m$

$s_2 = 0.05m$

$b = 10cm$

$d_w = 10cm$

$t = 12h$



$$Q = \frac{2\pi k b (h_2 - h_1)}{\ln\left(\frac{r_2}{r_1}\right)}$$

$$= \frac{2\pi T (h_2 - h_1)}{\ln\left(\frac{r_2}{r_1}\right)}.$$

$$= \frac{2\pi T (s_1 - s_2)}{\ln\left(\frac{r_2}{r_1}\right)}$$

$\left[\because h_1 = H - s_1 \right.$
$\left. h_2 = H - s_2\right]$

$h_2 - h_1 = (H - s_2)$
$- (H - s_1)$
$= s_1 - s_2$.

$$T = \frac{Q \ln \frac{r_2}{r_1}}{2\pi (s_1 - s_2)}$$

$$= \frac{0.125 \ln \frac{40}{10}}{2\pi (2.5 - 0.05)}$$

$$= \frac{0.125 \times 1.386}{15.392}$$

$$T = 0.0113 \ m^2/min$$

$$T = K \times b.$$

$$0.0113 = K \times 10$$

$$K = \frac{0.0113}{10}$$

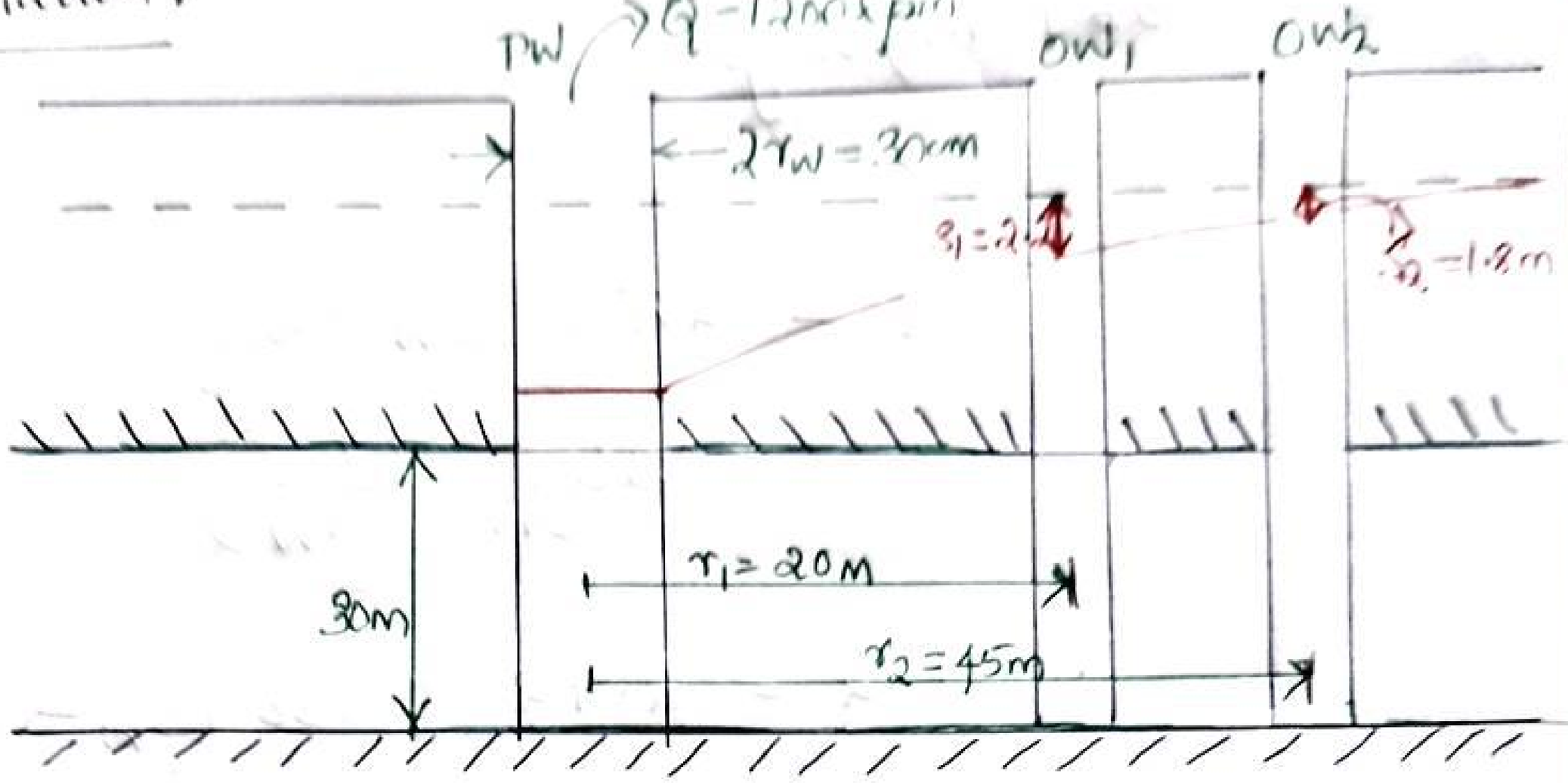
$$= 0.00113 \ m/min \ . \ (Ans)$$

QUESTION 2:

A 30cm well fully penetrates a confined aquifer 30m deep. After a long period of pumping at a rate of 1200 lpm, the drawdowns in the wells at 20 and 45m for the pumping well are found to be 2.2 and 1.8m, respectively. Determine the transmissibility

of the aquifer. What is the drawdown in the pumped well?

Solution:



$$Q = \frac{2\pi T (s_1 - s_2)}{2.303 \log\left(\frac{r_2}{r_1}\right)}$$

$$1.2 = \frac{2.72 \times T (2.2 - 1.8)}{\log\left(\frac{45}{20}\right)}$$

$$T = \frac{1.2 \times \log\left(\frac{45}{20}\right)}{2.72 (2.2 - 1.8)}$$

$$= 0.338 \ m^2/min$$

So the transmissibility of the aquifer is $0.338\ m^3/min/m$. or $559\ m^2/day$

$$Q = \frac{2\pi T (S_W - S_2)}{2.303 \log_{10}\left(\frac{r_2}{r_W}\right)}$$

$$1.2 = \frac{2.72 (0.338 (S_W - 1.8)}{\log\left(\frac{45}{0.15}\right)}$$

$$S_W = 4.62\ m$$

∴ Drawdown of the pumping well is $4.62m$