CVL 732: Ground Water Hydrology

1st Semester 2021-22 **Max. Marks: 65**

Major Test - Online **Time: 2 Hour**

Q. 1. Draw a velocity hodograph for seepage through an equilateral triangle shaped earth dam on impervious foundation having free board and tail water. Explain the mapping of each boundary in physical plane onto hodograph plane. **(5 Marks)**

Q. 2. A basin 400 m $\times$ 3000 m is proposed to recharge 6×10^7 m^3 per year. The initial depth of water table is 45 m, saturated thickness of aquifer is 25 m, and transmissivity is 1825 m^2/day. If the maximum allowable rise in mound is 35 m, determine the location of production wells. **(5 Marks)**

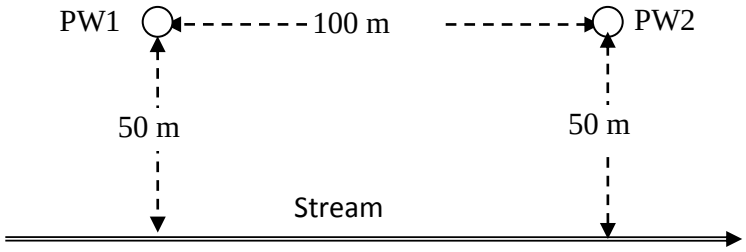
Q. 3. A farmer owns farm of 300 m $\times$ 400 m size, in which the initial water table is 1.5 m below the ground level. The underlying aquifer has hydraulic conductivity 1.0 m/day and saturated thickness 20 m. The estimated recharge from irrigation return flow is 6 cm/day. The farmer plans to maintain the water table atleast 3 m below the ground level by a pumping well at centre of a farm for better crop. Determine the steady state minimum pumping rate required for this purpose and also corresponding radius of influence. **(5 Marks)**

Q. 4. The foundation in a construction site (70 m by 50 m) is 6 m deep while the position of the prevailing water table is 4.0 m below the ground surface. A stream is running parallel to the longer side at a distance of 50 m. The site is to be dewatered upto 0.5 m below the foundation level in one month using two equal capacity pumping wells at corners. Determine the preferred location of two pumps and corresponding pumping rate if the initial saturated thickness, the transmissivity and the storage coefficient of the aquifer are 25 m, 1500 m^2/day and 0.15 respectively. **(5 Marks)**

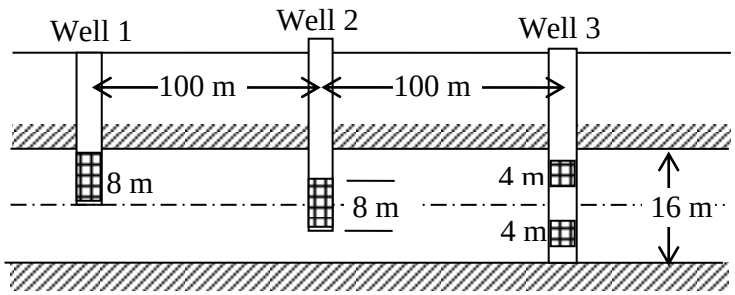
Q. 5. Three fully penetrating pumping wells form an equilateral triangle of side 100 m in an unconfined aquifer with hydraulic conductivity = 45 m/day and initial saturated thickness = 40 m. These wells are pumped at same discharge rate. Determine the maximum discharge rate so that the steady drawdown at any point should not be more than 1 m. Assume the dia. of the wells = 30 cm and the radius of influence = 1000 m. **(5 Marks)**

Q. 6. An unconfined coastal aquifer has hydraulic conductivity 28 m/day and is underlain by a horizontal impervious layer 35 m below MSL. Freshwater discharge towards sea is 5 m^3/day/m and the densities of fresh water and salt water are 1005 kg/m^3 and 1030 kg/m^3 respectively. Determine the initial location of the toe of the interface. What would be the safe distance of a well from the shoreline if the well were pumped at 200 m^3/hour and the corresponding distance of the stagnation point? **(12 Marks)**

Q. 7. Two wells PW1 and PW2 as shown in Fig near a stream in a confined aquifer having $S = 3\times10^{-4}$ and $T = 0.0048$ m^2/s are pumped at constant flow rates to produce drawdown 2 m in PW1 after 1 day of pumping and drawdown 4 m in PW2 after 3 days of pumping. Determine the discharges from PW1 and PW2 wells. Assume the diameter of each well is 20 cm. **(6 Marks)**



Q. 8. Determine the steady drawdown in the middle well if all three partially penetrating wells are pumped simultaneously. Use radius of influence = 120 m and diameter of well = 0.4 m. **(8 Marks)**



Q. 9. A well (2 m diameter) in a confined aquifer (T = 500 m^2/day) is pumped such that a draw down difference of 6 m is created between the well and at a radial distance of 16 m. Determine the heads at A and B as shown in Fig. by finite difference method using logarithmic transformation of distance and also compare the results with the analytical solution. **(14 Marks)**