

**B. TECH.**  
**(SEM VI) THEORY EXAMINATION 2017-18**  
**GROUND WATER & WELL PUMP ENGINEERING**

*Time: 3 Hours**Total Marks: 100*

**Note:** Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

**1. Attempt *all* questions in brief. 2 x 10 = 20**

- a. What do you mean by secondary porosity?
- b. List out the assumptions made in the analysis of steady radial flow into well.
- c. What is meant by overdraft?
- d. What are self priming devices?
- e. Differentiate between transmissibility & hydraulic conductivity.
- f. What is the effect of speed on head capacity?
- g. What do you mean by Vadose water?
- h. What do you mean by well shrouding?
- i. Define perched aquifer.
- j. What is effect of change of impeller diameter on the pump performance?

**SECTION B**

**2. Attempt any *three* of the following: 10 x 3 = 30**

- a. Two observation wells which are located in a confined aquifer at distances of 160 m and 90 m from the discharge well showed a drawdown of 3 m and 5 m respectively. If the thickness of confined water bearing strata is 10 m and water is being pumped at the rate of  $30 \text{ m}^3/\text{day}$ . Calculate the hydraulic conductivity of aquifer.
- b. An unconfined aquifer has an areal extent of  $15 \text{ km}^2$ . When 9.5 million  $\text{m}^3$  of water was pumped out, the water table was observed to go down by 2.4 m. what is the specific yield of the aquifer? If the water table of the same aquifer rises by 12.5 m during a mansoon season, what is the volume of recharge?
- c. Write short notes on the following:
  - i. Surface and subsurface sources of water
  - ii. Artificial recharge of groundwater
  - iii. Groundwater prospecting
- d. What do you understand by mixed flow pumps? Why they are needed and explain their performance characteristics.
- e. Write short notes on the following :
  - i. Submersible pump
  - ii. Pump selection
  - iii. Well interference
  - iv. Movement of ground water

### SECTION C

**3. Attempt any one part of the following: 10 x 1 = 10**

- (a) Enumerate the different methods by which the ground water is drained and used in our country.
- (b) Derive an expression for the steady state discharge of well fully penetrating into a confined aquifer.

**4. Attempt any one part of the following: 10 x 1 = 10**

- (a) Derive "Jacob's" equation for non-steady state flow in aquifers. Also mention the assumptions used.
- (b) Explain different types of tube wells in detail. Also describe different types of strainers used in constructing well.

**5. Attempt any one part of the following: 10 x 1 = 10**

- (a) A 20 cm diameter well penetrates fully a confined aquifer of thickness 25 m. when the well is pumped at a rate of 200 litres/minute the steady state drawdown in the two observations wells located at 10 m and 100 m distance from the pumping well are found to be 3.5 m and 0.05 m respectively. Calculate the permeability and the transmissibility of the aquifer
- (b) What is the average life of tube wells and what are the reasons for their failure? What remedies will you suggest for increasing their life?

**6. Attempt any one part of the following: 10 x 1 = 10**

- (a) Design a tubewell to deliver 33,000 gallons per hour at a depression head of 5 m. The average water level is 10 m below the ground in October and 15 m in July. The geological investigation has yielded the following results at the site of boring:

Depth (m)	0-5	5-20	20-30	30-50	50-60	60-70	Below 70 m
Types of strata	Surface clay	Very fine sand	Clay with kankar	Coarse sand	Clay	Medium sand	Clay with sand stone

- (b) Explain the construction, working and maintenance of propeller pump.

**7. Attempt any one part of the following: 10 x 1 = 10**

- (a) Describe Hydraulic Ram, its principle and operation with suitable line diagram.
- (b) Explain the pollutants of ground water on which ground water quality persists. What are the measures of water quality? Show a vector diagram for representing analysis of ground water quality.