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B. TECH.
(SEM VI) THEORY EXAMINATION 2018-19
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 are the types of impellers used in the centrifugal pump?
   b.   What do you mean by secondary porosity?
   c.   List out the assumptions made in the analysis of steady radial flow into well.
   d.   Differentiate between shallow and deep well.
   e.   What are self-priming devices?
   f.   What is Perched water table?
   g.   What do you mean by well shrouding?
   h.   What do you understand by well Log? Why it is prepared?
   i.   What do you mean by Vadose water?
   j.   Define aquifuge and aquitaurd.

SECTION B

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

   a.   In an artesian aquifer of 8 m thick, a 10 cm diameter well is pumped at a constant rate of 100 lit/minute. The steady state drawdown observed in two wells located at 10 m and 50 m distances from the centre of the well are 3 m and 0.05 respectively, compute the transmissibility and the hydraulic conductivity of the aquifer
   b.   Derive "Jacob's" equation for non-steady state flow in aquifers. Also mention the assumptions used.
   c.   A tube well commands 40 hectares of land under wheat. When the well is discharging at constant rate, the water level in the well drops to R.L. 160.2 m. The R.L. of highest land is 166.5 m. The duty for wheat is 1600 hectares/cumec. Taking the pump efficiency as 75% calculate the input H.P. of the pump.
   d.   What do you understand by mixed flow pumps? Why they are needed and explain their performance characteristics.
   e.   What is deep well turbine pump? When are they adopted? Explain the installation, operation and maintenance of turbine pumps.

SECTION C

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

   (a)   What are the various types of bore wells commonly used in our state? Discuss them in detail.
   (b)   Distinguish between non- equilibrium and equilibrium conditions in an aquifer from which water is withdrawn through a well. Explain when the above conditions can be expected in an aquifer.

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

   (a)   An unconfined aquifer has an aerial extent of 15 km^2. When 9.5 million 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?

   (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)   Design an open well in fine sand to give a discharge of 0.005 cumec when worked under a depression head of 3 m. Take the value of the specific yield for the fine sand as 0.5 m^3/hour per square m of area, under unit depression head.

   (b)   Derive an equation for discharge and phreatic surface, when an infiltration gallery is dug down to the impervious soil layer

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

   (a)   Design a tube well 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)   What are the common types of bone-wells popular in the State? Describe in detail.

   (b)   Discuss step-by-step procedure commonly adoptedin conducting pumping test. Why is well logging essential?For what purposes different characteristics aredocumented?