II B. Tech II Semester Regular Examinations, June/July - 2022
GROUND WATER HYDROLOGY, WELL AND PUMPS
(Agricultural Engineering)

Time: 3 hours   **Max. Marks: 70**

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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UNIT-I

1   a)   Define groundwater and explain about vertical distribution of groundwater.   [7M]

    b)   Explain about different types of aquifers.   [7M]

Or

2   a)   In an unconfined aquifer extending over 4 km^2, the water table was initially at 26 m below the ground surface. After sometime an irrigation of 20 cm (full irrigation), the water table rises to a depth of 25.5 m below the ground surface. Afterward 1.5×10^6 m^3 of groundwater was withdrawn from this aquifer, which lowered the water table to 27.5 m below the ground surface. Determine: (i) specific yield of the aquifer, and (ii) soil moisture deficit (SMD) before irrigation.   [7M]

    b)   In an area of 200 ha, the water table declines by 3.5 m. If the porosity of the aquifer material is 30% and the specific retention is 15%, determine: (i) specific yield of the aquifer, and (ii) change in groundwater storage.   [7M]

UNIT-II

3   a)   List out the functions of wells.   [7M]

    b)   Explain about the classification of open wells.   [7M]

Or

4   a)   Discuss briefly about the types of subsurface groundwater exploration techniques.   [7M]

    b)   Explain about effective size and uniformity coefficient in gravel packing.   [7M]
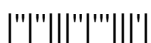
UNIT-III

5   a)   Derive an expression to determine the aquifer characteristics from an unconfined aquifer under steady state condition.   [7M]

    b)   A well in a confined aquifer is pumped at a constant rate of 1200 m^3/min. After 600 min of continuous pumping the drawdowns in the piezometers used for the pumping test were measured. The results are as follows: [7M]

Distance of piezometer from center of well (m)	2	10	50	100	200
Drawdown (m)	7.25	4.75	2.50	1.50	0.50

Calculate the transmissibility values of different sections and average transmissibility using the Thiem Procedure I.

Or

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6 a) Explain about the effect of partial penetration of wells. [7M]

   b) Explain about the constant-head permeameter and Falling-head permeameter with neat sketches. [7M]

UNIT-IV

7 a) Explain the types of reciprocating pumps. [7M]

   b) Explain about the solar photo voltaic pumping system. [7M]

Or

8 a) Explain about the methods of artificial groundwater recharge. [7M]

   b) What do you understand about the basic concepts of groundwater management. [7M]

UNIT-V

9 a) A pump lifts 100,000 litres of water per hour, against a total head of 20 metres. Compute the water horse power. If the pump has an efficiency of 75 per cent, what size of prime mover is required to operate the pump? If a direct drive electric motor with an efficiency of 80 per cent is used to operate the pump, compute the cost of electrical energy in a month of 30 days. The pump is operated for 12 hours daily for 30 days. The cost of electrical energy is 20 paise per unit. [7M]

   b) State affinity law. Discuss effect of change of pump speed on pump performance and on impeller diameter. [7M]

Or

10 a) Explain about the working principle and operation of the hydraulic ram. [7M]

   b) A hydraulic ram operates at a drive head of 3 m and a delivery head of 20 m. The flow through the drive pipe is 10 l/s and the discharge at the outlet of the delivery pipe is 1.2 l/s. Compute the efficiency of the ram adopting (i) D'Aubuisson's ratio and (ii) Rankine's formula. [7M]