INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

End-Autumn Semester Examination 2022-23

Date of Examination: 26/4/23 **Session:** AN **Duration:** 3 hrs. **Full Marks:** 50

Subject No.: AG41202 **Subject:** Groundwater Hydrology

Department/Center/School: Agricultural and Food Engineering

Specific charts, graph paper, log book etc., required: NO

Special Instructions (if any): Answer all questions and make reasonable assumptions if data is not available

Question 1: (5+5 =10)

a) Develop a summary on the influence of atmospheric pressure on groundwater levels.

b) Discuss the electrical resistivity method of groundwater exploration

Question 2: (6+4 =10)

a) Define the following aquifer properties

i) Specific yield

ii) Specific storage

iii) Hydraulic resistance

b) Discuss the influence of streamflow on groundwater levels

Question 3: (6+4 =10)

a) Discuss any three artificial recharge of groundwater methods.

b) A fully penetrating tubewell in a confined aquifer has a maximum discharge capacity of 5000 L/min. The aquifer is overlain and underlain by impervious layers. The thickness of the aquifer is 32 m. Design the length of the well screen, assuming the effective area of the available strainer to be 20% and the diameter of the well 15 cm.

Question 4: (4+6 =10)

a) Discuss any two groundwater recharge estimation methods

b) An aquifer has a cross-section with a horizontal width of 265 m, and a vertical thickness below the water table of 42 m. The water table is 36 m below the ground surface. Each day, 3340 m^3 of water is discharged through the cross section. The aquifer rock has an effective porosity of 27.1%. Find a) the Darcy speed, and b) the actual speed of the water as it passes through the aquifer.

Question 5: (4+6 =10)

a) Explain the seismic refraction method of groundwater exploration.

b) An infinite number of fully penetrating wells are located in a straight line in a confined aquifer at equal spacing of 100 m. The radius of the well is 5 cm, the thickness of the aquifer is 30 cm, the hydraulic conductivity of the aquifer is 5 cm/min and the discharge of the well is 10 L/s. Calculate the drawdown

i) At a distance of 500 m from the line of wells

ii) At the face of each well, and

iii) Half way between the wells