BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: M.TECH **SEMESTER : III**
BRANCH: CEE **SESSION : MO/19**

SUBJECT: CE554 ENVIRONMENTAL GEOTECHNICS

TIME: 3 HOURS **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) What is the role of soil chemistry and hydrogeology in geoenvironmental engineering? [5]
Q.1(b) Discuss the multidisciplinary nature of geoenvironmental engineering. [5]

Q.2(a) What is the difference between retardation and retention of contaminants? How does oxidation-reduction reaction help in contaminant attenuation reaction in soil? [5]
Q.2(b) Calculate the total potential of a saturated soil at 20^0 C at a point 1.5 m below the reference datum. Saturated volumetric water content is 0.6.1 cm^3 of soil at this point has $4x10^{-4}$ moles of solute. Water table is 1m above reference datum. γ_{sat} = 20.34 KN/m^3 [5]

Q.3(a) Explain the concept of 3R's and waste management hierarchy. [5]
Q.3(b) A batch test was conducted for 3 soil samples A, B, C with an initial concentration of 120 mg/l of $SrCl_2$. 6 g of each of the soil sample is mixed 75ml, 100ml and 300ml of $SrCl_2$ and the values of C_e for A are 12, 10 and 8 mg/l, for B it is 15, 12 and 9 mg/l and for C it is 6, 5, 4 mg/l respectively. Compare the reactivity of the soil- contaminant system of the three soils and comment on the role of liquid to solid ratio on the sorption capacity of the three soil. [5]

Q.4(a) What are the processes involved in the planning of contaminated site remediation? [5]
Q.4(b) Prepare a scheme for the design of permeable reactive barrier [5]

Q.5(a) Explain any steady state method of measuring thermal property of soil. [5]
Q.5(b) A falling head permeability test is conducted in centrifuge on a soil sample 6cm in length and $100cm^2$ in CSA. In a time interval of five minutes the head dropped from 60 cm to 20cm. Area of stand pipe is 2 cm^2 Porosity was 35%. The centrifuge is rotated at 600 RPM. Effective radius 40cm. Determine prototype permeability, prototype length, model velocity, prototype velocity and prototype seepage velocity. What will be the time taken in days if the same test is conducted at 1g? [5]

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