JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2024

BTech - IV Semester (CE)

COURSE CODE(CREDITS): 18B11CE411 MAX. MARKS: 35

COURSE NAME: Geotechnical Engineering

COURSE INSTRUCTORS: Prof. Ashok Kumar Gupta MAX. TIME: 2 Hours

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Note: *(a)All questions are compulsory.*

(b)Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

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Q1. Define consolidation. What is primary & secondary consolidation. Briefly discuss the test for consolidation. *CO4, CO5* **[1+1+3 = 5]**

Q2. The soil fill for a road embankment is to be compacted in place to a void ratio of 0.7. If the void ratio of the borrow pit soil is 1.2, how many cubic meters of compacted fill can be placed in the embankment per 1000 cubic meters of borrow materials? If no water is either added or lost during the placement of the fill, what would be the percentage change in the degree of saturation of the soil? The compacted fill is not fully saturated. *CO1, CO4* **[5]**

Q3. Calculate the coefficient of permeability of a soil sample 6 cm is height and 50 cm^2 in cross sectional area, if a quantity of water equals to 450 ml passed down in 10 minutes under an effective constant head of 40 cm. On oven drying, the test specimen weighs 495 g. Taking the specific gravity of soil solids as 2.65, calculate the seepage velocity of water during the test.

CO3 **[5]**

Q4. A cohesive soil yields a maximum dry density of 1.8 g/cc at an OMC of 16% during a standard proctor test. If the value of G is 2.65, what is the degree of saturation? What is the maximum dry density it can further compact to? *CO4* **[5]**

Q5. Derive the equation for Terzaghi's theory of one-dimensional consolidation.

CO1, CO3, *CO5* **[5]**

Q6. A water tank is supported by a ring foundation having outer diameter of 10 m and inner diameter of 7.5 m. The ring foundation transmits uniform load intensity of 160 kN/m^2. Compute the vertical stress induced at a depth of 4 m, below the center of ring foundation, using

a). Boussinesq's analysis

b). Westergaard's analysis, taking m = 0. *CO3, CO4* **[2.5 +2.5 = 5]**

Q7. The values of liquid limit, plastic limit and shrinkage limit of a soil were reported as: w_L = 60%, w_P = 30%, w_S = 20% If a sample of this soil at liquid limit has a volume of 40 cc and its volume measured at shrinkage limit was 23.5 cc, determine

a). Specific gravity of the solids

b). What is the shrinkage ratio and volumetric shrinkage? *CO2* **[3+2 = 5]**