Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– II(Old course) • EXAMINATION (Remedial) – WINTER- 2015

Subject Code: 2724309 Date: 10/12/2015

Subject Name: Soil Structure Interaction

Time: 2:30 pm to 5:00 pm Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** How settlement of footings can be estimated from constitutive laws, Explain in detail with steps. **07**

(b) Draw contact pressures distribution diagram under perfectly flexible footings and perfectly rigid footings. Justify your answer giving proper reason for such nature of diagram in sand and clay.

Q.2 **(a)** Which factors affect modulus of subgrade reaction (kh and kv) Explain any one in detail. **07**

(b) Discuss the various design philosophies given by Randolph for piled rafts. Explain Burlands approach when piles are designed as settlement reducers. **07**

OR

(b) Calculate the foundation pressure for the simply supported beam with point load of 2000kN acting at the centre of 40m span. Assume K = 5 x 10^5 kg/m^2 and E = 2 x 10^9 kg/m^2. **07**

Q.3 **(a)** Which methods are available to compute elastic settlements? Explain elastic settlement based on theory of elasticity in detail. **07**

(b) Explain in detail the solution of a beam on an elastic foundation using FDM given by Malter. **07**

OR

Q.3 **(a)** Estimate the immediate settlement of a concrete footing 1.5m x 1.5m in size founded at a depth of 1m in silty soil whose modulus of elasticity is 90kg/cm2. The footing is expected to transmit a unit pressure of 200 kN/m^2. Take $\mu = 0.35$, $I_f = 0.82$ for rigid footing. **07**

(b) Explain Winkler foundation and derive its equation for finding slope, deflection, moment, shear and load for a beam resting on elastic foundation. **07**

Q.4 **(a)** How to get the lateral displacement in case of laterally loaded pile? Explain in detail with neat sketchs. **07**

(b) A steel pile of 620mm outside diameter with a wall thickness of 25mm is driven into loose sand (Dr = 30%) under submerged condition to a depth of 20m. The submerged unit weight of the soil is 8.85 kN/m^3 and Ø = 34°. The EI value of the pile is 4.37 x 10^2 MN-m^2. Compute the ground line deflection of the pile under lateral load of 268 kN at ground level under free head condition by Reese and Matlock method. Assume $\mathbf{n_h}$ = 6 MN/m^3. **07**

OR

Q.4 **(a)** A 300mm square wooden pile is driven 5m below ground level in pre-loaded clay. The load to be applied is 1m above the ground. Determine the ultimate load that can be applied on a pile with Mu = 110kNm. Assume Kh = 16 MN/m^2, E = 10 X 10^2 MN/m^2 and cohesion of clay = **07**

1kg/cm^2.Assume e/R = 1.83, Zf/R = 1.42, m = 0.62. Use IS 2911 method only.

(b) Explain linear elastic weightless spring approach given by Barkan for machine foundation. With reference to block foundation explain with neat sketch various types of motion for rigid foundation. **07**

Q.5 **(a)** What do you mean by curved failure surfaces? Explain logarithmic spiral method for determining passive earth pressure of sand with neat sketch. **07**

(b) Explain in detail PDR method for assessing vertical bearing capacity of piled raft foundation. **07**

OR

Q.5 **(a)** Give importance of contact pressure in Soil- Structure interaction. Explain contact pressures based on theory of elasticity. Define perfectly flexible and perfectly rigid conditions. **07**

(b) Calculate the foundation pressures and moments for a beam of 45m span with three point loads of 1500kN each spaced equally 15m apart from each other.Take K = 1 x 10^7 kg/m^2 and E = 2 x 10^9 kg/m^2. **07**

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