Final Assessment Test – November 2019

VIT
Vellore Institute of Technology

Course: CLE2014 - Geotechnical Earthquake Engineering
Slot: B1
Class NBR(s): 3515
Max. Marks: 100
Time: Three Hours

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION, IS EXAM MALPRACTICE

Reference to codes IS5249 and IS1893 is permitted

PART – A (3 X 20 = 60 Marks)

Answer ALL Questions

1. Many important structures such as Pearl Research Park (Fig. 1) with G + 7 floors, Boys Hostel R-Block with G + 18 floors are proposed to be constructed in VIT. Though IS 1893-Part1-2016 classify Vellore as seismic zone III (PGA = 0.16g), considering important structures in VIT, Vellore Fort and CMC, we need to evaluate seismic hazard of Vellore.

   How will you carry out deterministic seismic Hazard Analysis (DSHA) of Vellore?

Fig.1

2. a) How will you evaluate shear wave velocity of a site from SPT test? With neat sketches, explain about the equipment and procedure. [10]

   b) A vertical vibration test was conducted on a concrete block measuring 1.0 × 1.0× 1.5 m deep placed on the surface of a sandy clay soil (Bulk unit weight of soil = 17.5 kN/m^3; Poisson's ratio of soil = 0.25; Unit weight of concrete = 25 kN/m^3). The water table was encountered at a depth of 1 m. The saturated unit weight of soil below water table is measured as 19.5 kN/m^3. Mechanical oscillator has a mass of 50 kg. The frequency at which the maximum displacement occurs is determined in a number of trials; the average resonant frequency is 2400 rpm. Determine [10]

   (i) Coefficient of elastic uniform compression (C_u) and dynamic shear modulus (G) for the test condition.

   (ii) Dynamic shear modulus (G) at a depth of 3.0 m below the ground surface.

3. The bore log of a site in Vellore, located in seismic zone III, is shown in Fig.2. The water table is located at 2.15 m. The bulk unit weight of CL layer is 18 kN/m^3. The saturated unit weight of SP and SM layers is 20 kN/m^3. Fine content of SP and SM layers is 15%.

   (i) Estimate the factor of safety against liquefaction by simplified procedure (as per IS1893-Part1-2016) at depths of 2.5 m, 3.8 m, 6 m and 9 m. Assume suitable data.

   (ii) If the site is located in North-Eastern region of India (seismic zone – V), evaluate it's liquefaction potential.

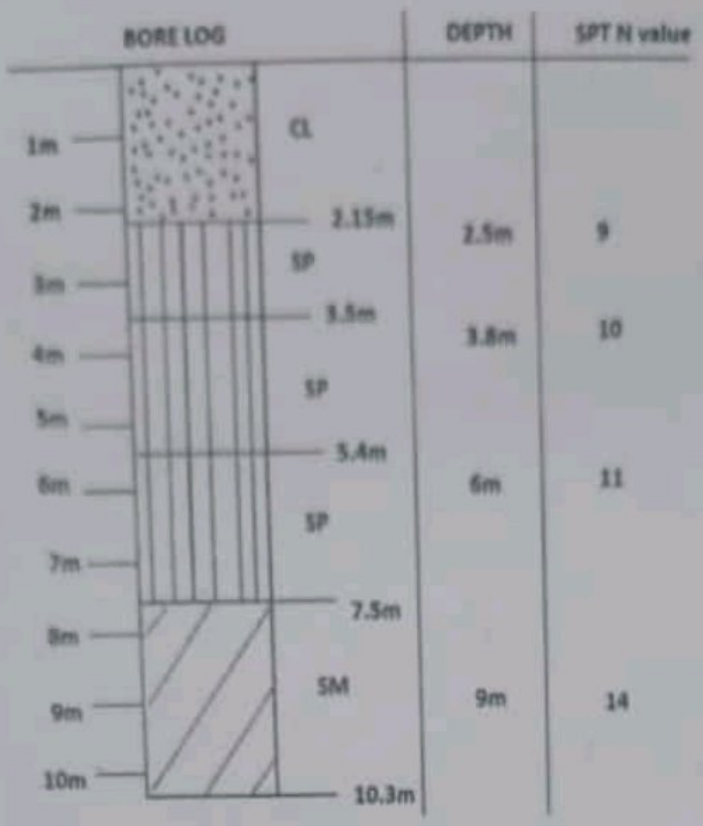

Figure 2

PART – B (2 X 20 = 40 Marks)

Answer any TWO Questions

) Differentiate between body wave and surface wave. List various types of seismic waves with neat sketches and mention their properties. [12]

b] Why Richter magnitude scale is not suitable for magnitudes greater than 7? [8]

Discuss the importance of Ground Response Analysis with suitable examples. [20]

a) How will you estimate various ground motion parameters? [10]

b) Mention typical attenuation relationship and discuss various parameters involved. [10]

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