

B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

June, 2018

00603

**BICEE-013 : ELEMENTS OF SOIL DYNAMICS
AND MACHINE FOUNDATION**

Time : 3 hours

Maximum Marks : 70

*Note : Answer any **five** questions. All questions carry equal marks. Assume missing data, if any. Use of scientific calculator is permitted.*

1. Define – Degree of freedom, Amplitude, Forced vibration, Damping, Logarithmic decrement, Magnification factor, Phase lag. 14

2. (a) Write a brief note on shear modulus for large strain amplitude. 7

- (b) A soil specimen was tested in a resonant column device (torsional vibration and fixed end condition) for finding the shear modulus. The length, diameter and mass of the specimen are 9 cm, 3.5 cm and 150 gm respectively. The frequency at normal mode of vibration ($n = 1$) was 800 cps. Find the shear modulus. 7

3. A reciprocating machine is symmetrically mounted on a block of size $4.0 \text{ m} \times 3.0 \text{ m} \times 3.5 \text{ m}$. The block is embedded in the ground by 2.0 m depth. The machine vibrating at a speed of 250 rpm and generates maximum vertical unbalanced force of 2.5 kN and maximum horizontal unbalanced force of 2 kN at a height of 0.2 m above the top of the block. The torque about the z-axis is 4 kN/m . The weight of the machine is small as compared to that of the foundation. The limiting amplitude of the machine is 150 microns . The soil data are

$$\text{Saturated density} = 20 \text{ kN/m}^3$$

$$\text{Angle of shearing resistance} = 35^\circ$$

$$C_u = 3.62 \times 10^4 \text{ kN/m}^3$$

$$G = 1.10 \times 10^4 \text{ kN/m}^2$$

$$E = 2.98 \times 10^4 \text{ kN/m}^2$$

$$\mu = 0.35.$$

Determine the natural frequencies and amplitudes by the weightless spring method. 14

4. Differentiate motion isolation with force isolation. Explain with sketches. Explain how the stiffness of the isolator is determined by using the mathematical model. 14

5. Explain how the dynamic active earth pressure is determined by the modified Culmann's graphical method. 14

 6. Describe the method of obtaining the maximum horizontal dynamic load that can be applied on the footing. Write the expression for finding the rotation of the footing. 14

 7. Discuss the vibro-flotation technique for the compaction of the soil. What are the factors that affect compaction ? 14

 8. Explain how the factors of safety of finite and infinite slopes are determined under static and dynamic conditions. 14
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