

(Following Paper ID and Roll No. to be filled in your Answer Books)

Paper ID : 100854

Roll No.

B.TECH.

Theory Examination (Semester-VIII) 2015-16

MACHINE FOUNDATION DESIGN

Time : 3 Hours

Max. Marks : 100

Note: Attempt all the Sections. If required any missing data; then choose suitably.

Section-A

1. **Attempt all parts. All parts carry equal marks. Write answer of each part in short. (2×10=20)**
 - a. Classify the machine foundations according to I.S. Code.
 - b. Describe the factors affecting coefficient of elastic uniform compression.
 - c. What are the main objectives of cyclic plate load test?
 - d. List the various laboratory methods used to determine the dynamic properties of soils.

- e. What is the main difference between two bore hole technique and three bore hole technique?
- f. What do you understand by active isolation and passive isolation?
- g. Write an expression for natural frequency of a block foundation under rocking vibrations.
- h. Explain the resonance and its effect.
- i. Discuss the main criteria for design of impact type of machines.
- j. Write the values of permissible amplitudes suggested by B.I.S for the foundations of reciprocating and rotary types of machines.

Section-B

2. Attempt any five questions from this section.

(10×5=50)

- a. Derive the general equation of motion for damped free vibration of a single degree of freedom system.
- b. A machine weighing **100 kg** is supported directly on springs having a stiffness of **200 kg/m**. The unbalanced rotating mass results in a disturbing force of **20 kg** at a speed of **3000 rpm**. The damping factor is **0.1**. Determine the amplitude of vibration and the force transmitted to the foundation.

(2)

- c. Using Barkan's approach; determine the coefficient of uniform compression, if a vibration test on a block **1.5m x 0.75m x 0.7m** gave a resonance frequency of **20 Hz** in the vertical direction. The mass of the oscillator used was **100 kg**. The mass density of the test block material is **2400 kg/m³**.
- d. What are the seismic wave propagation tests? Explain how the shear modulus is estimated by seismic cross hole technique.
- e. What are the properties of the good vibrating isolation material? List out and describe the properties of any two vibration isolating materials.
- f. Describe criteria for a satisfactory machine foundation. Also explain the methods of decreasing vibrations of exciting foundations.
- g. Discuss the principles of design of foundation for reciprocating machine with clear illustrations.
- h. Write the reinforcement and construction details of different type of machine foundations. Explain the suitability of various machine foundations for the different types of machines?

Section-C

Note: Attempt any two questions from this section.

(15×2=30)

- Q3. Discuss the degrees of freedom of rigid block foundation and explain the salient points in 'linear elastic weightless method' and 'elastic half-space method' of analysis of rigid block foundation. Also discuss the analysis of rigid block foundation under pure sliding vibration.
- Q4. Derive an expression for logarithmic decrement in terms of damping factor. A foundation weighs 800 ' kN. The foundation and the soil can be approximated as a mass - spring - dashpot system. If the spring constant, $k = 20 \times 10^4$ kN/m and the dashpot coefficient, $c = 2340$ kN-m/s, determine the following:
- (i) Natural circular frequency
 - (ii) Critical damping coefficient
 - (iii) Damping ratio
 - (iv) Logarithmic decrement and
 - (v) Damped natural circular frequency.
- Q5. Classify the machines based on the design criteria and operating systems. Discuss the need of dynamic analysis in soils and foundations. What is the general data required with regard to machines for designing machine foundations.