Code No: 07A80107 **R07** **Set No. 2**

IV B.Tech II Semester Examinations,April/May 2012
SOIL DYNAMICS AND MACHINE FOUNDATIONS
Civil Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Describe the three principles which make the basis of seismic wave propagation theory. [16]
2. Explain mechanical isolation with neat sketch. [16]
3. Explain the analysis of a block foundation subjected to pure rocking vibration.[16]
4. Discuss the following:
   (a) Under damped system,
   (b) Critically damped system,
   (c) Over damped system. [16]
5. (a) Explain how the natural frequency of foundation soil system is estimated using the Barken's analysis and IS code method.
   (b) In Pauw's analysis, the base of the machine is 2 × 2 m, penetrating 1.5 m below ground level. If the amplitude of vibration is 0.03 mm, apply the reduction factor for embedment and determine the likely amplitude. [8+8]
6. Explain with neat sketches how the shear wave velocity of soil strata is estimated using seismic up hole, down hole and cross-hole techniques. [16]
7. Derive the expressions for frequencies and amplitude for the case of undamped free vibrations of a two degrees freedom system. [16]
8. A machine of mass, M = 500 kg is mounted on a simply supported steel beam of length, L = 2m having a rectangular section with depth of 0.1 m, width of 1.2 m and Young's modulus, E = 2.06 × 1011 N/m^2. To reduce the vertical deflection, of the beam, a spring of stiffness k is attached as shown in Figure 1. Determine the value of k needed to reduce the deflection of the beam by:
   (a) 25% of its original value
   (b) 50% of its original value
   (c) 75% of its original value. [16]

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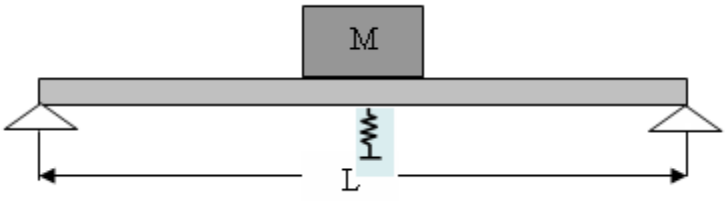

Figure 1.

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Code No: 07A80107 **R07** **Set No. 4**

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1. (a) Why dynamic soil properties are evaluated? List the various laboratory and field tests for dynamic soil properties.

   (b) A block vibration test was performed on a block made up of M_{15} grade concrete of size 1m x 1m x 1m using vertical excitation. The unit weight of concrete is 24 kN/m^3. For the results given below, determine the coefficient of elastic uniform compression and the damping ratio. Also, determine the coefficient of elastic uniform compression if the foundation base area is 9 m^2. [8+8]

Frequency (rpm)	600	700	800	900	950	1100	1125
Amplitude (mm)	0.12	0.32	0.64	2.40	2.08	1.68	1.36

2. Describe the wave propagation in an infinite, homogeneous, isotropic and elastic medium. [16]

3. Discuss about the dynamic response of embedded block foundations. [16]

4. Discuss Tschebotarioff's reduced natural frequency. Describe the factors affecting coefficient of elastic uniform compression. [16]

5. Write in detail on modeling of machine foundation. [16]

6. An electric motor of mass 60 kg, rated speed 3000 rpm and an unbalance of 0.002 kg-m, is to be mounted on an isolator to achieve a force transmissibility of less than 0.25. Determine:

   (a) Stiffness of the isolator

   (b) Dynamic amplitude of the motor and

   (c) The force transmitted to the foundation. [16]

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7. Starting from fundamentals, obtain the equations of motion for over damped, critically damped and under damped systems and discuss their effect on amplitude of vibration. [16]

8. Obtain the necessary expressions for frequencies and amplitudes for the case of forced vibrations of a two degrees freedom system. [16]

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Code No: 07A80107 **R07** **Set No. 1**

IV B.Tech II Semester Examinations,April/May 2012
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Civil Engineering

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Answer any FIVE Questions
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1. Write briefly about the following:
   (a) Types of machines,
   (b) Types of machine foundations,
   (c) Permissible Amplitudes,
   (d) Permissible bearing Pressures. [16]

2. (a) What are the assumptions in Pauw's Analogy? Explain the bulb of pressure concept of estimation of apparent soil mass.
   (b) A foundation of base area 3m x 3m is laid at 1.5m below the ground level. If the amplitude of vibration is 0.02 mm, apply the reduction factor for embedment and determine the likely amplitude as per the Pauw's Analogy. [8+8]

3. Write a note on design approach for machine foundation. [16]

4. Design a suitable block foundation for a two-cylinder vertical compressor for the following data:
   Weight of compressor = 200 kN
   Operating speed = 600 rpm
   Total weight of rotating mass = 0.06 kN
   Total weight of reciprocating mass = 0.27 kN
   Safe bearing capacity of soil under static conditions = 100 kPa
   Elastic uniform compression = 45,000 kN/m^3
   Resultant unbalanced inertial force in vertical direction = 75 kN. [16]

5. An engine is mounted on a rigid foundation through four springs. During operation, the engine produces an excitation force at a frequency of 3000 rpm. If the weight of the engine causes the springs to deflect by 100 mm, determine the reduction in the force transmitted to the foundation. [16]

6. (a) Discuss the coefficient of elastic non uniform compression and explain how it is estimated in the field.
   (b) A cyclic plate load test was carried out on a soil deposit to estimate the elastic coefficients for the design of a compressor foundation. The test was carried out at a depth of 5m using a 0.6m × 0.6m test plate. For the data given below, plot the stress versus elastic settlement relationship and determine the coefficient of elastic uniform compression.

i. 0.6 × 0.6m plate area and

ii. 11m^2 footing area.

Take Poissons ratio = 0.32 and unit weight of soil = 17 kN/m^3. [8+8]

Stress (kN/m^2)	40	80	120	160	200	300	400
Elastic settlement (mm)	0.25	0.45	0.65	0.85	1.04	1.4	1.82

7. Derive the expression for natural frequency and amplitude of a block foundation subjected to vertical vibrations. [16]

8. (a) What are the body waves and surface waves? Discuss their ability in causing destruction to the foundations placed on elastic half space.

   (b) The data from serimic refraction test is given below. Determine the depth of the Layer using time intercept and critical distance approach. [8+8]

Distance of geophones from source (m)	0	4	8	12	20	25
Travel Time (milli seconds)	0	2	4	6	8	9

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Code No: 07A80107 **R07** **Set No. 3**

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Civil Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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1. An air compressor of mass 500 kg operates at a speed of 1800 rpm. The rotating parts are well balanced. The mass of reciprocating parts are of 15 kg. The crank radius is 120 mm. If the dampers for the mounting introduce a damping factor of 0.15:
   (a) Specify the springs for the mounting such that only 20% of the unbalanced force is transmitted to the foundation.
   (b) Determine the amplitude of transmitted force. [16]
2. (a) Discuss natural frequency, operating frequency and resonance. Explain how the resonance is avoided in vibrating system.
   (b) Determine the coefficient of uniform compression, if a vibration test on a block 1.2m x 1m x 0.8m gave a resonance frequency of 20 Hz in the vertical direction. The mass of the oscillator used was 80 kg. The mass density of the test block material is 2400 kg/m^3. Use the Barkan's approach. [8+8]
3. Write briefly about the following:
   (a) Resonance and its effects
   (b) Degrees of freedom with examples
   (c) Damping ratio and frequency ratio with applications
   (d) Operating frequency and natural frequency. [16]
4. Explain the principle involved in seismic survey and its wave propagation. Explain the its economic aspects. [16]
5. Explain the criteria for design of machine foundations. [16]
6. Explain briefly with sketches the different types of foundation supports for impact type machines. [16]
7. Briefly discuss about the surface wave propagation test and seismic cross hole test and explain how to compute the dynamic soil properties. [16]
8. Explain the various modes of vibration of a block foundation with neat sketches. [16]

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