**Code No: C2009** **R09**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**M.Tech I - Semester Examinations, March/April-2011**
**SOIL DYNAMICS AND FOUNDATION ENGINEERING**
**(STRUCTURAL ENGINEERING)**

**Time: 3hours** **Max. Marks: 60**

**Answer any five questions**
**All questions carry equal marks**
**- - -**

1. Write briefly about the following.
   i) Types of machines ii) Types of machine foundations,
   iii) Permissible amplitudes iv) Permissible bearing Pressures. [12]

2.a) What do you understand by over damped, critically damped and under damped systems.
   b) Derive an expression for logarithmic decrement in terms of damping factor. [6+6]

3.a) Explain in detail, how the coefficient of elastic uniform compression can be computed using Barken's method.
   b) Using Barken'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/$m^3$. [4+8]

4.a) Briefly explain the forced vibration test and explain how to compute the dynamic soil properties.
   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 0.3m x 0.3m test plate. For the data given below, plot the stress versus elastic settlement relationship and determine the coefficient of elastic uniform compression at
   i) 0.3 x 0.3m plate area and ii) 6$m^2$ footing area. Take Poisson's ratio = 0.40 and unit weight of soil = 14 kN/$m^3$. [6+6]

| Stress (kN/$m^2$) | 15 | 30 | 45 | 60 | 75 | 100 | 150 |
|---|---|---|---|---|---|---|---|
| Elastic settlement (mm) | 0.2 | 0.39 | 0.58 | 0.75 | 0.92 | 1.24 | 1.84 |

5.a) Define and discuss critically the 'radiation damping' and 'internal damping'. Write the negative effects of damping.
   b) Determine the coefficient of uniform compression, if a vibration test on a block of 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 unit weight of the test block material is 24 kN/$m^3$. [6+6]

6.a) Discuss the IS code method for natural frequency of foundation soil system.
   b) Discuss the salient points in the Pauw's analogy and write how apparent soil mass is computed using this analogy. [6+6]

**Contd……2**

7.a) Discuss the parameters involved in Hsieh's analogy for vertical vibrations.

b) Explain how the natural frequency of a footing is influenced by its shape on vibratory response. [6+6]

8.a) Discuss the properties of vibration isolating materials such as steel and cork.

b) Design a suitable foundation block for a double acting steam hammer whose data are given below. Weight of the falling ram = 5.0 t, height of the drop = 1.5 m, area of the piston = 0.2 $m^2$. Average steam pressure on piston = 120 $t/m^2$. Weight of the anvil = 100.0t. base area of the anvil = 6.0 $m^2$, Weight of the frame = 1.5t, which is fixed to the foundation block, the thickness of the pad under the anvil is 0.60 m, 'E' of the material of pad = 5.0 x $10^4$ $t/m^2$, coefficient of impact (restitution) = 0.65, soil properties: coefficient of uniform compression = $C_u$ = 4.5 x $10^3$ $t/m^3$, mass density of soil = 1.9 g/cc. safe bearing capacity of the soil is 25 $t/m^2$. [6+6]

**--ooOoo--**