CODE NO: 07A80107 | R07 | SET No - 1

IV B.TECH - II SEMESTER EXAMINATIONS, APRIL/MAY, 2011
SOIL DYNAMICS AND MACHINE FOUNDATIONS
(CIVIL ENGINEERING)

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

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1. Write a note on Free Vibrations and Forced Vibrations. Starting from fundamentals, discuss the equations of motion for over damped, critically damped and under damped systems. [16]

2(a) Write a note on Barkan's approach for determination of natural frequency.
(b) Using Barkan's approach determine the coefficient of uniform compression, if a vibration test on a block 1.5mx0.75mx0.7m 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. [16]

3. What do you understand about wave propagation in elastic half space? Discuss the characteristics of body waves and surface waves with neat sketches. [16]

4(a) What is coefficient of elastic uniform compression? Explain how it is determined from the block resonance test.
(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 3m using a 0.6m x 0.60m test plate. For the data given below, plot the stress versus elastic settlement relationship and determine the coefficient of elastic uniform compression at (i) 0.6 x 0.6m plate area and (ii) 10m^2 footing area. Take Poissons ratio = 0.35 and unit weight of soil = 18 kN/m^3. [16]

Stress (kN/m^2)	50	100	150	200	250	300	350
Elastic settlement (mm)	0.05	0.28	0.52	0.8	1.06	1.34	1.6

5(a) Discuss the general design requirements of machine foundations with suitable remarks.
(b) Write briefly about the following
(i). types of machines, and (ii). types of machine foundations. [16]

6(a) 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.
(b) Discuss the analysis of rigid block foundation under pure sliding vibration. [16]

7. The following particulars give the data for design of a foundation for impact machine. Weight of ram = 16.5 kN, height of fall of ram = 0.7 m, weight of anvil and frame (without ram) = 350 kN, efficiency of drop, η = 0.80, coefficient of restitution, e = 0.6, steam pressure, p_s = 800 kN/m^2, area of piston, A_p = 0.15 m^2, limiting frequency of anvil w_{na} = 230 rad/s, limiting natural frequencies of the combined system, w_{n1} = 280 rad/s, w_{n2} = 80 rad/s, coefficient of rigidity of pad, k_2 = 25 x 10^5 kN/m and anvil base area, A_2 = 3 m^2. Estimate the following: (i) velocity of the dropping parts, (ii) velocity of the anvil motion, (iii) amplitude of

vibration of the foundation, (iv) amplitude of vibration of the anvil and (v) the dynamic stress in the elastic pad. [16]

8(a) What is vibration isolation? Discuss active and passive isolation methods of vibration.

(b) List the various isolation materials and write the properties of steel and cork. [16]

* * * * * *

CODE NO: 07A80107 | R07 | SET No - 2

IV B.TECH - II SEMESTER EXAMINATIONS, APRIL/MAY, 2011
SOIL DYNAMICS AND MACHINE FOUNDATIONS
(CIVIL ENGINEERING)

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

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1) Write a note on the following:
(a) Free vibration and Forced vibration
(b) Damping ratio and effects of resonance
(c) Natural frequency and damped natural frequency
(d) Logarithmic decrement and Magnification factor. [16]

2(a). What do you understand by bulb of pressure concept proposed by Balakrishna and Nagaraj with reference to machine foundation design?
(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. [16]

3. What do you understand about wave propagation in elastic half space? Discuss the characteristics of seismic waves such as P and S waves and also the R and L waves with neat sketches. [16]

4(a). Discuss the salient points in steady state surface wave propagation test and discuss its limitations.
(b). A block vibration test was performed on a block made up of M_{15} grade concrete of contact area 2 m^2 using vertical excitation. The weight of concrete block is 50 kN. For the results given below, determine the coefficient of elastic uniform compression and the damping ratio. [16]

Frequency (rpm)	700	1150	1450	1850	2450	2900	3100	3300
Amplitude (mm)	0.5	0.9	1.31	2.02	3.72	2.67	2.2	1.76

5(a). Classify the machines based on the design criteria and operating systems. Discuss the need of dynamic analysis in soils and foundations.
(b). Write briefly about the following
(i). types of machines, and (ii). types of machine foundations. [16]

6(a). Discuss the degrees of freedom of rigid block foundation and explain the various modes of vibration of rigid block foundation with neat sketch.
(b). Discuss the analysis of rigid block foundation under vertical vibration. [16]

7. Discuss the principles of design of foundation for reciprocating machine with clear illustrations. [16]

8(a). Discuss active and passive isolation methods of vibration. Explain the importance of vibration isolation in case of machine foundations.
(b). What are the properties of the good vibrating isolation material? List out and describe the properties of any two vibration isolating materials. [16]

*****

CODE NO: 07A80107 | R07 | SET No - 3

IV B.TECH - II SEMESTER EXAMINATIONS, APRIL/MAY, 2011
SOIL DYNAMICS AND MACHINE FOUNDATIONS
(CIVIL ENGINEERING)

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

Answer any FIVE questions
All Questions Carry Equal Marks

\- - -

1(a). Starting from fundamentals, derive the expression for natural frequency of SDOF system of free vibration subjected to no damping.
(b). Derive an expression for logarithmic decrement in terms of damping factor. [16]

2(a). Discuss how the Young's modulus and amplitude is estimated using Barkan's analysis.
(b). The coefficient of elastic uniform compression of a soil is found to be 24000 kN/m^3 using a plate of diameter 4m. What would be percentage variation in its value if the diameter of the plate is halved? [16]

3. What do you understand about wave propagation in elastic half space? Discuss the characteristics of seismic waves such as P and S waves and also the R and L waves with neat sketches. [16]

4(a). What are the seismic wave propagation tests? Explain how the shear modulus is estimated by seismic cross-hole technique.
(b). Determine the coefficient of uniform compression, if a vibration test on a block of 1mx1mx1m gave a resonance frequency of 30 Hz in the vertical direction. The mass of the oscillator used was 60 kg. The mass density of the test block material is 2400 kg/m^3. [16]

5(a). Classify the machines based on the design criteria and operating systems. Discuss the need of dynamic analysis in soils and foundations.
(b). What is the general data required with regard to machines for designing machine foundations. [16]

6(a). Discuss the degrees of freedom of rigid block foundation and explain the various modes of vibration of rigid block foundation with neat sketch.
(b). Discuss the analysis of rigid block foundation under vertical vibration. [16]

7. 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 = 100.0 t. base area of the anvil = 6.0 m^2. Weight of the frame = 1.5 t, 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 x10^3 t/m^3. Mass density of soil = 1.9 g/cc. safe bearing capacity of the soil is 25 t/m^2. [16]

8(a). What is vibration isolation? Discuss the circumstances where active and passive isolation methods of vibration are used.
(b). What are the properties of the good vibrating isolation material? List out and describe the properties of any two vibration isolating materials. [16]

*****

CODE NO: 07A80107 | R07 | SET No - 4

IV B.TECH - II SEMESTER EXAMINATIONS, APRIL/MAY, 2011
SOIL DYNAMICS AND MACHINE FOUNDATIONS
(CIVIL ENGINEERING)

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

Answer any FIVE questions
All Questions Carry Equal Marks
- - -

1(a). Derive an expression for logarithmic decrement in terms of damping factor.
(b). 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 x 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. [16]

2(a). Describe the factors affecting co-efficient of elastic uniform compression. Explain how natural frequency is estimated from Barkan's analysis.
(b). Assuming resonance to have occurred at the frequency of 22 cps in a vertical vibration of a test block 1mx1mx1m size, using Barkan's analysis determine the coefficient of elastic uniform compression. The weight of the oscillator is 62 kg and the force produced is by it at 12 cps is 100 kg. Also compute the maximum amplitude of vertical vibration at 12 cps. [16]

3. What do you understand about wave propagation in elastic half space? Discuss the characteristics of body waves and surface waves with neat sketches. [16]

4. What do you understand about the following? Explain their practical significance.
i) Coefficient of uniform compression,
ii) Coefficient elastic uniform shear,
iii) Coefficient of elastic non uniform compression and
iv) Coefficient elastic non uniform shear. [16]

5(a). Discuss the general design requirements of machine foundations with suitable remarks.
(b). Explain the limiting amplitude of vibrations for a particular frequency and write a note on permissible stresses. [16]

6(a). 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.
(b). Discuss the analysis of rigid block foundation under pure sliding vibration. [16]

7. Discuss the principles of design of foundation for impact type machine with clear illustrations. [16]

8(a). What do you understand by active and passive vibration isolation methods? Discuss the importance of vibration isolation in machine foundations.
(b). List the various isolation materials and write the properties of steel and cork. [16]

*****