Code No: NR420106 **Set No.1**

IV B.Tech. II Semester Regular Examinations, April/May -2005
SOIL DYNAMICS & MACHINE FOUNDATION
(Civil Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What are the general requirements of data for design of machine foundations?
   (b) The natural frequency of a machine foundation is 4 hertz. Determine its magnification at the operating frequency of 8 hertz. Take damping factor as 0.30. Also determine the maximum transmitted force, if the magnitude of the exciting force is 120KN.
2. (a) Discuss the criteria for the design of foundation of a reciprocating type machine.
   (b) Explain with neat sketches various types of machine foundations used for different kinds of machinery.
3. (a) Explain the essentials of the elastic half-space theory for the design of machine foundation.
   (b) The resonant frequency of a block foundation, excited by an oscillator is observed as 20 HZ. The amplitude of vibration at resonance is 1mm. The magnitude of dynamic force at 20HZ is 5 KN. If the total weight of the block and oscillator is 20 KN, Calculate the damping factor associated with it.
4. (a) Explain free vibration with damping and bring out the meaning of over damped, under damped and critically damped conditions.
   (b) Explain:
      i. Coefficient of elastic uniform compression.
      ii. Logarithmic decrement.
      iii. Magnification factor
      iv. Damping factor.
5. (a) Why is vibration isolation required? Describe the methods of vibration isolation.
   (b) Determine the natural frequency of a machine foundation which has a base area of 2.20 m X 2.20 m and the weight of 155KN. Take the value of the coefficient of elastic uniform compression as $4.4X10^4 kN/m^3$.
6. (a) Explain how can you determine shear modulus from wave theory.
   (b) Explain how can you determine elastic properties of soil for dynamic purpose.
   (c) Explain elastic waves and their characteristics.
7. (a) Differentiate between

i. Free and forced vibration
ii. Active and Passive isolation.

(b) Explain Pauws analogy of foundation soil system.

8. Explain the following:

(a) Reslsners solution and its limitations.

(b) lamb and the dynamic Boussinesqs problem.

(c) Bulb of pressure concept.

(d) Resonance and its effect.

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Code No: NR420106 **Set No.2**

IV B.Tech. II Semester Regular Examinations, April/May -2005
SOIL DYNAMICS & MACHINE FOUNDATION
(Civil Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Formulate the equation of motion of a single degree of freedom damped model. For what conditions there can be under damped, over damped and critical damped cases?

   (b) Give neat sketches of the different types of machine foundations commonly used, and indicate clearly when each of there is preferred.

2. (a) Discuss the criteria for the design of foundation of a impact type machine.

   (b) What is meant by vibration isolation? Describe the methods of vibration isolation.

3. (a) What are general requirements of Machine foundations?

   (b) The foundation for a gas engine with a vertical and vertically oscillating parts has the following data:

   Total weight of engine = 50 KN

   Speed of rotation = 300 rpm

   Weight of block = 250 KN

   Weight of participating sail = 200 KN

   Spring stiffness = 60×10^4 KN/m

   Determine the natural frequency and maximum amplitude. Take damping factor=0.1 the unbalanced vertical force is 12 KN.

4. (a) Explain pauws analogy of foundation sail system.

   (b) A machine having a total weight of 20,000 KN has an unbalance such that it is subjected to a force of 5000 KN at a frequency of 600 rpm. What should be the spring constant for the supporting springs if the maximum force transmitted into the foundation due to the unbalance is to be 500 KN. Assume that the damping can be neglected.

5. (a) Explain how you determine the coefficient of elastic uniform compression for a sail. Also give the expression for computing the natural frequency of a machine foundation system, subjected to linear vertical vibration.

   (b) In a block test, a resonant frequency of 18 cps was observed in vertical vibrations. Determine the coefficient elastic uniform compression. A machine weighing 90 KN is to be supported an a block size 3m x 4m x 2m high. Determine its natural frequency in vertical vibrations. Assume unit weight of concrete is 24 KN/m^3.

6. (a) Explain how can you determine the shear modulus from wave theory.
   (b) Explain the following:-
      i. Elastic waves and their characteristics
      ii. Bulb of pressure concept.
7. (a) Explain the following:-
      i. Lamb and the dynamic Bonssinesqs problem
      ii. Resonance and its effect.
   (b) Differentiate between:-
      i. Free and forced vibration.
      ii. Active and passive isolation.
8. Explain the following:-
   (a) Reslsners solution and its limitations
   (b) Barkans method of machine foundation design
   (c) Logarithmic Decrement
   (d) Magnification factor.

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Set No.3

IV B.Tech. II Semester Regular Examinations, April/May -2005
SOIL DYNAMICS & MACHINE FOUNDATION
(Civil Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Classify the machine foundations based on structural form and operating frequency of machines.
   (b) A foundation weighs 800 KN. The foundation and soil can be approximated as a mass-spring dashpot system. Given spring constant as 2,00,000 KN/m, dashpot coefficient as 2940 KN-sec/m. Determine the critical damping, damping factor. If the foundation is subjected to a vertical force of Q = Q_o sin wt in which Q_o = 25 KN, W = 100 rad/sec, determine the amplitude of the vertical vibration of the foundation.

2. (a) Discuss the criteria for the design of foundation of a Impact type machine.
   (b) Why is vibration isolation required? Describe the methods of vibration isolation.

3. (a) What are general requirements of machine foundations?
   (b) The following data refers to a vertical resonance test carried out on a 1.5 x 0.75m x 0.70 m (high) concrete block for estimating dynamic elastic constants for the design of a forge hammer foundation:

frequency (CPS)	20	25	30	35	40	45
Amplitude (mm)	0.018	0.030	0.068	0.120	0.138	0.130

   The test was carried out at a depth of 6m below ground surface. The soil at the site was clay of low to intermediate compressibility. Assuming the weight of oscillator motor as 2100N, draw the amplitude - frequency flat and determine the value of coefficient elastic uniform compression for 10 m^2 base area. Assume unit weight of concrete as 24 KN/cum.

4. (a) Why is it necessary to design a foundation keeping its natural frequency away from op
   (b) Briefly explain the Barkans method of machine foundation design.
   (c) Determine the coefficient of elastic uniform compression if the vibration test on a block 1m X1m X 1m gave resonance frequency of 30 hertz in the vertical direction. The mass of the oscillator used was 600N and the unit weight of concrete is 24 KN/cum.

5. (a) Derive the expression for natural frequency for free vibration with out damping.

(b) Determine the amplitude of vibration for machine foundation given the following particulars:
Mass of machine = 50,000 N
Frequency of machine = 600 rpm
Dynamic force = 600 N
Coefficient of elastic uniform compression = $45000KN/m^3$
Base dimensions = 1m X 2m X 1m
Assume unit wt of concrete is 24 KN/m^3

6. (a) Explain how can you determine shear modulus from wave theory.
   (b) Explain how can you determine elastic properties of soil for dynamical purpose.
   (c) Differentiate between:
      i. Free and forced vibration
      ii. Barkans and I.S method of determining natural frequency.

7. (a) Explain Pauws analogy of foundation soil system.
   (b) Explain the following:
      i. Lamb and the dynamic Boussinesqs problem.
      ii. Bulb of pressure concept.

8. Explain the following:
   (a) Resonance and its effect.
   (b) Elastic waves and their characteristics.
   (c) Magnification factor.
   (d) Active and passive isolation.

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Code No: NR420106 **Set No.4**

IV B.Tech. II Semester Regular Examinations, April/May -2005
SOIL DYNAMICS & MACHINE FOUNDATION
(Civil Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) What are the general requirements of machine foundation?
   (b) Explain the spring mass system and how it is used to analyse free vibrations.
2. (a) Discuss the criteria for the design of foundation of a reciprocating type machine.
   (b) What is meant by vibration isolation? Explain how it is done.
3. (a) Explain with neat sketches various types of machine foundations used for different kinds of machinery.
   (b) A vibration test was conducted on a foundation block resting on soil. The amplitude of first peak was 7.2mm on an oscilloscope. The second peak was not recorded clearly. If the amplitude of the third peak was 2.2mm,determine the damping factor of the system .If the critical damping co-efficient is 0.30,find the damping co-efficient.
4. (a) Explain how you determine the co-efficient of elastic uniform compression for a soil. Also give the expression for computing the natural frequency of a machine foundation system, subjected to linear vertical vibration.
   (b) A block vibration test was performed on a M15 concrete block size 1m x 1m x 1m using vertical excitation .The unit weight of concrete is 24 KN/Cum.The results are as follows:

Frequency(rpm):	600	700	800	900	950	1100	1125
Amplitude(mm)	0.12	0.32	0.64	2.4	2.08	1.68	1.36

   Determine the magnitude of co-efficient of elastic uniform compression and internal damping.
5. (a) Explain Pauw‘s analogy of foundation soil system.
   (b) A machine weighing 500KN is mounted on a concrete block resting on soil. The base area of the block is $25m^2$,and the weight is 100KN.The co-efficient of elastic uniform compression of the soil is 1.1 x 10^5 KN/Cum .Calculate the natural frequency of the system.
6. (a) Differentiate between
      i. Active isolation and passive isolation.
      ii. Free and forces vibration.

(b) In a test block of size 1.5m x 1.0m x 0.75m,resonance occurs at a frequency of 20 cycles per second in the vertical vibration. Determine the co-efficient of elastic uniform compression if the mass of oscillator is 700N and the force produced by it at 15 cycles per second is 1000N.

7. (a) Expain the following :
   i. Elastic waves and their characteristics
   ii. Bulb of pressure concept.

   (b) The natural frequency of a machine foundation is 4 hertz .Determine its magnification at the operating frequency of 8 hertz. The damping factor as 0.30.Also determine the maximum transmitted force if the exciting force is 100KN.

8. (a) Explain the following:
   i. Lamb and the dynamic Boussinesq's problem
   ii. Barken's method for determinatio of natural frequency.

   (b) Explain how can you determine the shear modulus from wave theory.

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