



DEPARTMENT OF CIVIL ENGINEERING

MAJOR EXAM :CVL861 ANALYSIS AND DESIGN OF MACHINE FOUNDATIONS (2015-16)

Time allowed: 2 hours
Venue : V 216

Date : 17 Nov 2015
Max marks : 35

NOTE: (a) This question paper contains six questions and two printed pages only. (b) All questions are compulsory.
(c) Assume any data which you deem is necessary but not supplied. (d) Draw neat and clear sketches wherever required.

QUESTION 1

Elaborate and reason out the difference in the specifications for frequency ratios and amplitudes for block type and frame type machine foundations as per IS 2974. Clearly point out the possible reasons for more stringent or less stringent nature of the guidelines in the case of foundations for medium to high speed rotatory machines.

(5 marks)

QUESTION 2

List out any four advantages of carrying out the dynamic analysis of frame type machine foundation by 3D FEM using solid brick type elements, over the conventional manual 2D frame approach. List one possible shortcoming of this approach over the conventional method.

(5 marks)

QUESTION 3

For a 3x3 pile group (total nine piles) of end bearing piles, determine the vertical stiffness K_z and the bending stiffness K_θ about a horizontal axis passing through the neutral axis of the group. Each RC pile is 400mm in diameter and 30 m in length. The pile to pile spacing is 1200mm. The superimposed weight transferred from the structure to the pile group is 9000kN.

(5 marks)

QUESTION 4

Determine the thickness of rubber pad of shore hardness 40 required to bring down the transmissibility of a machine foundation otherwise resting on rock below to 5%. The mass of the machine is 50t and the rubber pads, which are five in numbers, are of size 200x200mm.

(5 marks)

QUESTION 5

Determine the natural frequency of vertical and horizontal vibrations of an RC frame of a machine foundation of size 5x3m, with each member of dimensions 600x600mm, using the **resonance method**. The machine exerts a weight of 100 kN at the midpoint of the beam and a UDL of 30 kN/m. The effects of shear and axial force and also the loads transferred from the cross frames may be ignored for simplicity.

(5+5 =10 marks)

QUESTION 6

For the same machine foundation frame covered in Question 5 above, determine the frequency of vertical vibrations by the **amplitude method**, ignoring the contribution from the cross-beams. Comment on the value obtained in comparison with the approach adopted for Q5 above.

(5 marks)

