DEPARTMENT OF CIVIL ENGINEERING

MAJOR EXAM :CVL861 ANALYSIS AND DESIGN OF MACHINE FOUNDATIONS (2017-18)

Time allowed: 2 hours **Date** : 07 May 2018
Venue : **LH 418 (8-10am)** **Max marks** : 35

NOTE: (a) This question paper contains nine 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

List any three measures you would suggest to rule out vibration problems associated with the operation of air-conditioning related equipment in office type buildings.

(**3 marks**)

QUESTION 2

What fatigue factor has been suggested for frame type machine foundations (for medium and high frequency machines)? At what stage during analysis and design checks it is supposed to be considered and when not to be considered?

(**4 marks**)

QUESTION 3

Under what conditions the approximation (EA/h) is valid for computing the stiffness of rubber pads used for isolation under a machine resting directly on a hard floor.

(**2 marks**)

QUESTION 4

Out of load combinations (a) and (d) of IS 2974 (III), can you say with certainty which one will govern the design of the frame structure including foundation?

(**5 marks**)

QUESTION 5

Determine all the forces generated by a machine operating at a frequency of 18 Hz if the connecting rod is 600 mm, weighs 1 kg and has its CG located 200 mm from the crank pin. The crank rod is 250 mm long of uniform cross section and weighs 0.6 kg. The weight of the piston is 1.8 kg.

(4 marks)

QUESTION 6

Which modes are most important from the point of view of the analysis and design of frame type machine foundations?

(3 marks)

QUESTION 7

A reciprocating type machine operating in vertical direction at 40 Hz rests on concrete floor with a padding of four rubber blocks of size 100x100x100 mm of shore hardness 50^{o}. The total mass of the machine and the housing unit is 2t. Determine the transmissibility considering a damping ratio of 10%.

(6 marks)

QUESTION 8

List all steps for carrying out harmonic analysis of a frame type machine foundation using ANSYS or any other equivalent 3D FEM software.

(3 marks)

QUESTION 9

An end bearing pile of 600 mm diameter and 10 m length is supporting and external weight of 1500 kN from the superstructure. Determine is vertical stiffness if concrete grade is M 25. What would be the bending stiffness of a group of four such piles located at corners of a square of 3.6 m

(5 marks)