DEPARTMENT OF CIVIL ENGINEERING

MAJOR :CVL 861ANALYSIS AND DESIGN OF MACHINE FOUNDATIONS (2020-21)

Time allowed: 1.5 hour
Venue : Online
Date : 14 May 2021
Max marks : **30**

NOTE: (a) This question paper contains three 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.

Determine the peak amplitude force in vertical and horizontal directions generated by a piston-crank system with following details: Mass of piston-0.5 kg, mass of connecting rod-1 kg (length 2 m), mass of crank- 0.5 kg (length: 0.6 m). Both the crank and the operating rod are uniform in cross section. The piston is vibrating in horizontal direction at a frequency of 100 Hz.

(7.5 marks)

Question 2.

A frame type foundation is to be designed for a turbo generator. The columns, four in numbers, are proportioned to be 800x800 mm and beams 500x100 mm based on analysis. The frame size in plan is 6x10 m c/c, with no overhang in any of the beams/ deck. The overall height of the columns is 7.5 m from the top of the sole plate. The deck plate is 500 mm thick. Mass of the machine including all components is 3000 kg. What minimum thickness of the sole plate shall be needed so as to ensure high degree of rigidity in accordance with IS 2974 (III). Assume that the sole plate extends 500 mm beyond the outer edge of columns on all sides.

(7.5 marks)

Question 3.

A concrete block of plan dimensions 1x1 m and thickness 1 m is proposed to support a reciprocating machine of mass 500 kg operating in vertical plane at 45 Hz and exerting a peak force of 9 kN. The corrected C_z of the underlying soil is $6x10^4$ kN/m^3. Under normal conditions, no operator shall be present near the machine since it will be controlled remotely.

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(a) Check the adequacy of the foundation block with regard to resonance and amplitude criteria.

(b) In case the foundation is not adequate, what alteration in dimensions shall be sufficient to satisfy the stipulated criteria of IS 2974 (I)?

(7.5+ 7.5 marks)