BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MTECH   SEMESTER : I
BRANCH: CIVIL   SESSION : MO/19

SUBJECT: CE503 STRUCTURAL DYNAMICS

TIME: 3 HOURS   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1   Derive the general equation for displacement for a damped Single degree of freedom system   [10]
        subjected to forced vibration.

Q.2   Consider one square slab of area 25 sqm and thickness 150mm which is supported by 4 columns each   [10]
        at one of its corner symmetrically. All of the columns are 4.5m long each. Column size is 450 mm x
        250mm. If all the columns and the slab is made up of only by M20 concrete, considering the slab as
        rigid, determine stiffness, natural frequency and time period for the entire system along both
        possible primary directions.

Q.3   Consider a 3 storey building (square in plan, having 4 columns at the edges) of floor mass of 2000kg   [10]
        on each floor and having square column of dimension 300mmx300mm each. Floor to floor height is
        4m. Considering the columns as mass less and the whole system as damp free, show the basic 3
        mode shapes of the structure.

Q.4   Derive the expression for time domain solutions (necessary for algorithmic sequence) of dynamic   [10]
        equation of motions by Central Difference method.

Q.5   Consider a Reinforced Concrete School building (having ordinary moment resisting frame) which is   [10]
        situated at Bangalore(Bengaluru) on soft soil and contains masonary infills in it. Consider Dead load
        14 KN/sqm for floors and 8 KN/sqm for roof. Consider live load of 6 KN/sqm for floors and 1.5
        KN/sqm for roof. Determine design seismic loads for each floor level. Plan and elevation of the
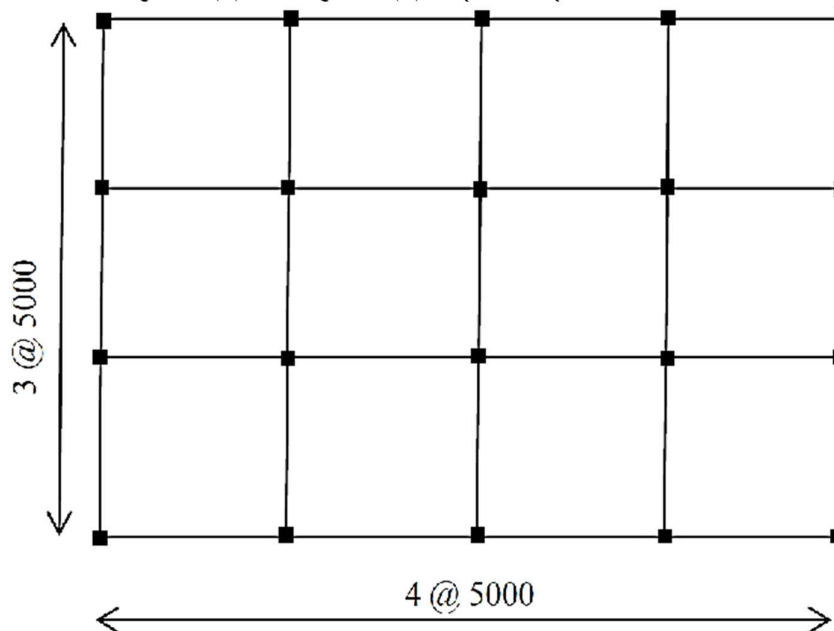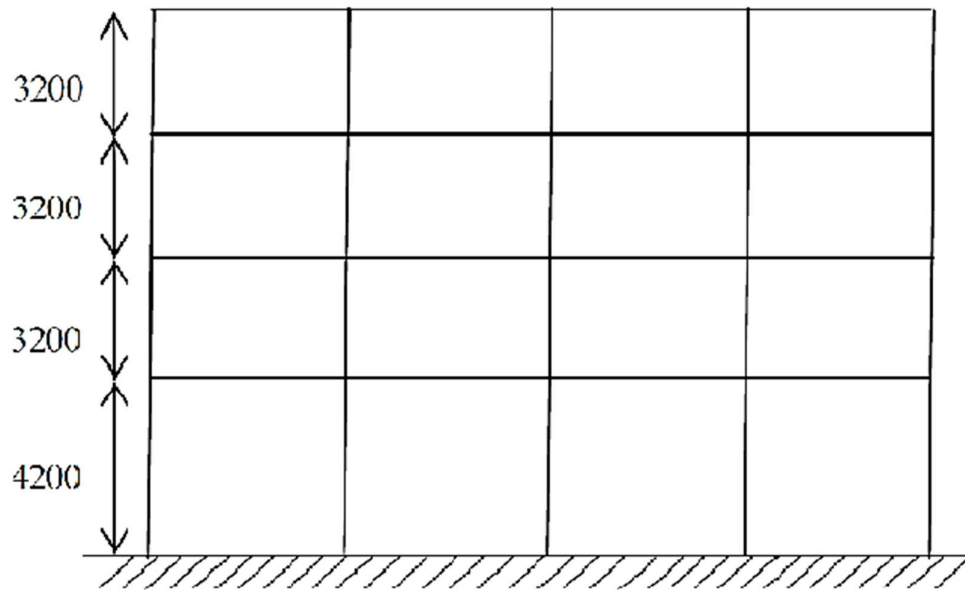   building is shown in Figure:3(a) and Figure:3(b) respectively.

Figure 3 (a)

Figure: 3 (b)