CLASS: M.Tech   SEMESTER: II
BRANCH: CIVIL ENGINEERING   SESSION: SP/19

SUBJECT: CE508 EARTHQUAKE ENGINEERING

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(a)   Write a short note on the classifications of seismic hazard assessment.   [5]
Q.1(b)   How the data from seismogram varies if we compare the data for an analog recording device to data   [5]
          for a digital recording device both stationed at same place and recording one particular earthquake
          data of medium shaking?

Q.2(a)   Consider one square slab of area 16 sqm and thickness 150mm which is supported by 4 columns each   [10]
          at one of its corner symmetrically. All of the columns are 3.5 meter long each. Column size is 300mm
          x 250mm for each columns. If all the columns and the slab is made up of only by M20 concrete,
          considering the slab as rigid, determine stiffness and time period for the entire system along both
          possible primary directions.

Q.3.   Consider a Reinforced Concrete School building (having ordinary moment resisting frame) which is   [10]
          situated at Delhi in Medium stiff soil condition with masonary infills in it. Consider Dead load 12 KN/sqm
          for floors and 10 KN/sqm for roof. Consider live load of 4 KN/sqm for floors and 2 KN/sqm for roof.
          Determine design seismic loads for each floor level. Plan and elevation of the building is shown in
          Figure:1(a) and Figure:1(b) Respectively.
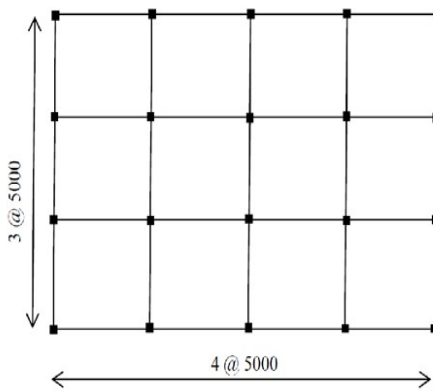

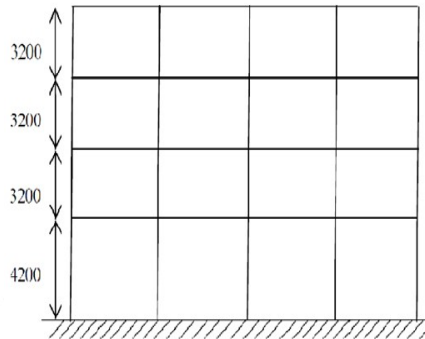Figure: 1(a)   Figure: 1(b)

Q.4(a)   What do you mean by sub-structuring method of soil structure interaction?   [3]
Q.4(b)   2 elements with total 3 numbers of nodes are shown in the figure (Figure: 2). Element 1 is having cross   [7]
          sectional area of 2000 sqmm and made up of steel, having young's modulus = 200 GPa and Element 2
          is having cross sectional area of 800 sqmm and made up of aluminium having young's modulus = 70
          GPa. The load (P) acting on node 2 is 220 KN. Find out nodal displacements and forces (vectors with
          proper signs) acting on each nodes.
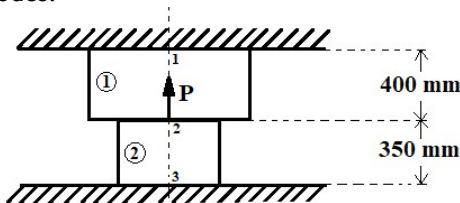

Figure: 2

Q.5(a)   How the working principle of base isolation systems varies from the working principle of different types   [5]
          of seismic dampers installed in any building?
Q.5(b)   Do base isolation techniques influence the modal shapes of a building? Explain.   [5]