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

CLASS: BE **SEMESTER : VII**
BRANCH: CIVIL **SESSION : MO/18**

SUBJECT: CE7001 EARTHQUAKE RESISTANT DESIGN

TIME: 3.00 HRS **FULL MARKS: 60**

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
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) How do can we classify body waves and how their characteristics in the direction of energy transmission differs from each other? [6]

Q.1(b) How the Focus of earthquake, Epicenter, our point of interest and the respective epicentral distance related to each other? [6]

Q.2(a) Consider a system in no damping condition where a mass of 0.5 kg is suspended in a vertical plane by a spring having a stiffness coefficient of 300 N/m. If the mass is displaced downward from its static equilibrium position through a distance 0.01 m determine: [7]
(i) the differential equation of motion; (1 marks)
(ii) the natural frequency of the system; (2 marks)
(iii) the natural time period of the system; (2 marks)
(iv) the response of the system as a function of time (2 marks)

Q.2(b) Obtain the differential equation of motion of the system (without damping) shown in Fig. 1 and determine the system natural frequency. [5]

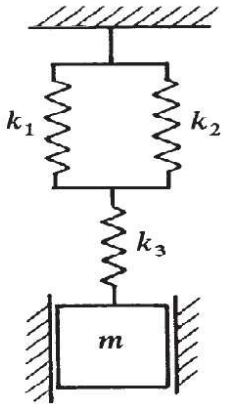

Figure: 1

Q.3(a) Derive the expression for time domain solutions of dynamic equation of motions by Central Difference method [8]

Q.3(b) How do we plot different forms of response spectra from series of vertical oscillators of different natural frequencies? [4]

Q.4 Determine the natural frequency and mode shape of a three storey reinforced concrete building with plan shown in Figure:2 (a) and elevation shown in Figure:2(b). Dimensions of column = 300mm x300mm; Roof slab thickness= 120mm; intermediate slab thickness= 140mm. Consider the building frame as a shear building. [12]

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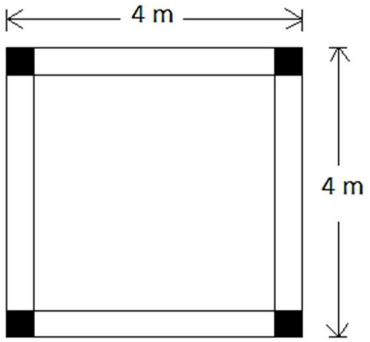

Figure: 2(a)

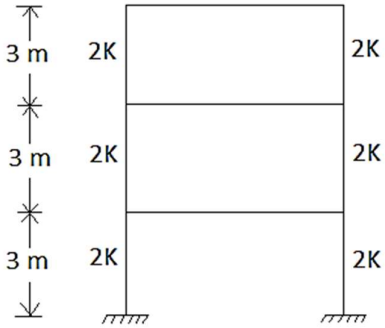

Figure: 2(b)

Q.5(a) What are the basic three philosophies we follow while designing earthquake resistant buildings? [6]

Q.5(b) How the shape of any structure affects its stability while resisting earthquake? [6]

Q.6 Consider a Reinforced Concrete School building (having ordinary moment resisting frame) which is situated at Asansol in Medium stiff soil condition which has 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:3(a) and Figure:3(b) Respectively. [12]

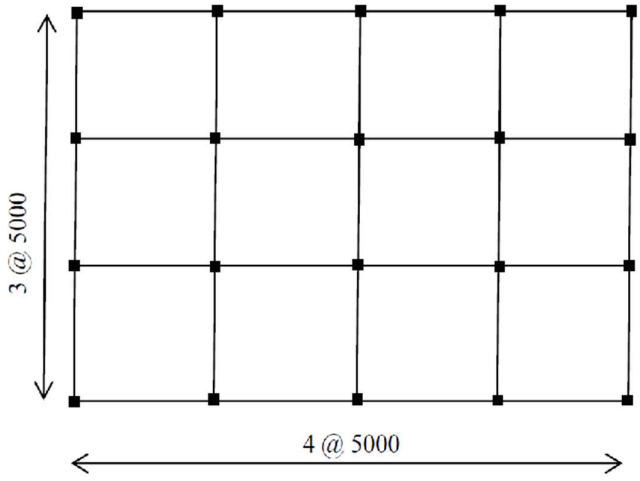

Figure 3 (a)

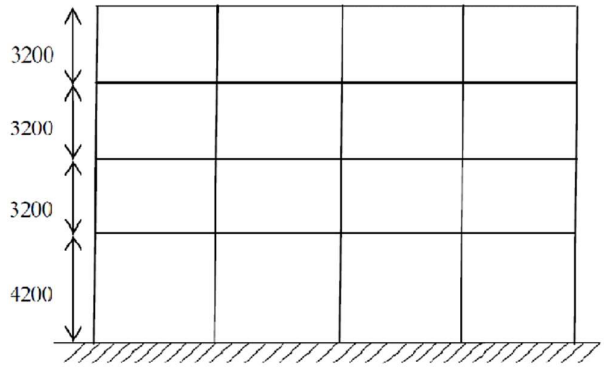

Figure: 3 (b)

Q.7(a) How the addition of heavy members has an impact on the centre if stiffness and centre of gravity of any structure and how do we deal with this? (4+3) [7]

Q.7(b) Write a short note on retrofitting strategies of Masonary Buildings. [5]

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