

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

CLASS: M.Tech.
BRANCH: Civil

SEMESTER : II
SESSION : SP/22

SUBJECT: Earthquake Engineering (CE508)

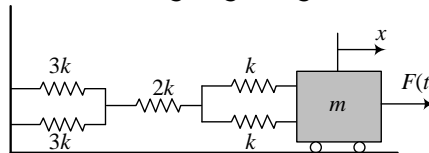
TIME: 2 Hours

FULL MARKS: 50

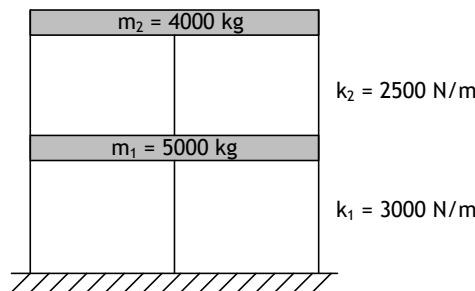
INSTRUCTIONS:

1. The question paper contains 10 questions each of 5 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. Use of Indian standard code IS: 1893 (Part-1):2016 is allowed in the examination hall.

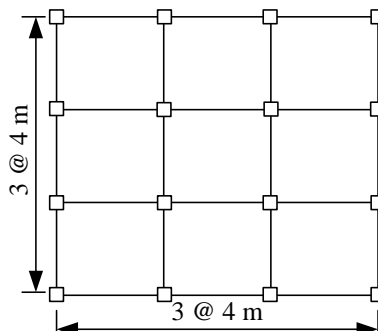
- Q.1 Write short notes on the followings: [5]
 a) Different plate boundaries, b) Seismic waves
- Q.2 Discuss the local site effect in context of earthquake response. [5]
- Q.3 Derive the equation of motion for the following single degree of freedom system [5]



- Q.4 The mass m , stiffness k , and natural frequency ω_n of an undamped SDoF system are unknown. These properties are to be determined by harmonic excitation tests. At an excitation frequency of 6 Hz, the response tends to increase without bound (i.e., a resonant condition). Next, a mass $\Delta m=5$ kg is attached to the mass m and the resonance test is repeated. This time resonance occurs at $f = 3$ Hz. Determine the mass and the stiffness of the system. [5]
- Q.5 Determine the natural frequencies and mode shapes of the two-storey structure shown in the given figure [5]



- Q.6 An 8-storey RCC concrete school building (having Special Moment Resisting Frame with masonry infill) [5] has plan dimensions as shown in the given figure. The storey height is 3.3 m. The DL per unit area of the floor is 4 kN/m². The intensity of live load on each floor is 3 kN/m² and on the roof is 1.5 kN/m². The soil below the foundation is medium stiff and the building is located in Shillong. Determine the design base shear for the building as per the equivalent static method of IS-1893 (Part-1): 2016.



- Q.7 Briefly discuss the four virtues of earthquake resistant design. [5]
- Q.8 Explain the followings: [5]
a) Response spectrum
b) Short column effect
- Q.9 Describe the 'Direct Method' and 'Sub-structuring Method' of solving soil-structure interaction problems. [5]
- Q.10 Explain the basic concept of base isolation in enhancing the seismic response of structures. [5]

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25/04/2022 E