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Paper id 100246 Roll No.

B.TECH
(SEM VIII) THEORY EXAMINATION 2018-19
EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

Time: 3 Hours ***Total Marks: 100***

Note: **1.** Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

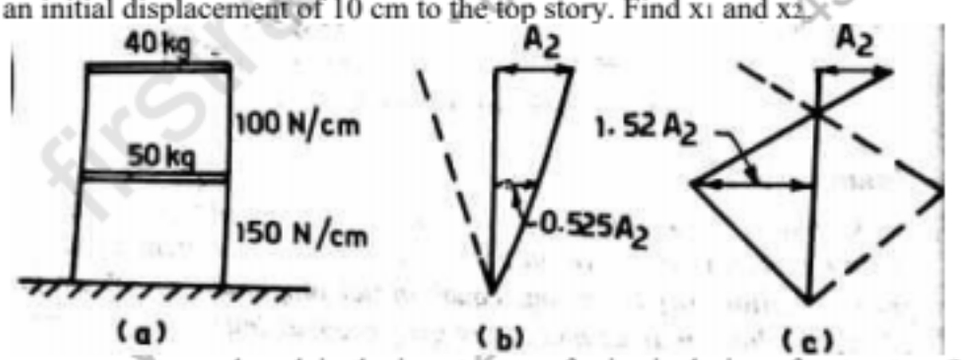
1. **Attempt *all* questions in brief.** **2 x10=20**

a. Define earthquake resistant design philosophies.
b. What factors of earthquake forces in a structure ?
c. Define isoseismals of an earthquake.
d. What are the dynamic behavior of soil?
e. Define radiation damping.
f. List out methods of modeling soil.
g. Define spring models.
h. Write spring models limitation.
i. Define lap splices.
j. Define restrotation.

SECTION B

2. **Attempt any *three* of the following:** **10x3=30**

a. Describe types and characteristics of typical dynamic loading with examples and essential characteristics of dynamic problem.
b. What are the plate tectonics and how they are related to continental drift and sea floor spreading.
c. Consider a two storied structure shown in figure . Let the system be given free vibration by giving an initial displacement of 10 cm to the top story. Find x_1 and x_2.



d. What is response spectra and explain the importance of seismic design of a structure ?
e. Describe the development of mass spring dashpot model from elastic half space theory.

SECTION C

3. **Attempt any *one* part of the following:**

a. Describe effects of earthquake. and also define moment magnitude.
b. Distinguish between the following (a) Body ways and surface ways (b) lithosphere and asthenosphere.

4. **Attempt any *one* part of the following:**

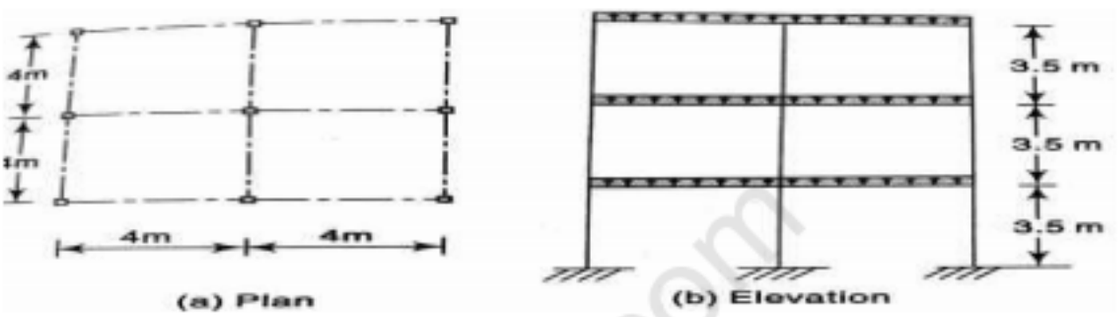
a. An SDOF system consist of a mass with weight of 175 kg and a spring costant k=530 kN/m . While testing the system a relative velocity of 30 cm/s was observed on application of a force of 450 N. Determine the damping ratio, damped frequency of vibration, logarithmic decrement, and the ratio of two consecutive amplitudes.

b. Derive a mathematical expression defining the dynamic displacements using d'Alembert's principle.

5. Attempt any *one* part of the following:

a. Describe the various earthquake –resistant features that can be introduced in a masonry building to make it earthquake resistant.

b. The plan and elevation of a three – storied RCC building shown in figure . the building is located in seismic zone V. The type of soil encountered is medium stiff and is proposed to design the building with a special moment –resisting frame. The intensity of DL is 10 kN/m^2 and the floors are to cater to an IL of 3kN/m^2. Determine the design seismic loads on the structure by static analysis.



6. Attempt any *one* part of the following:

a. Determine the frequency and design seismic coefficient for an ordinary masonry shear wall in a school building at Allahabad. For the given following data . Roof load P=15 kN/m, Height of wall h=3.0 m , Width of wall b=0.2 m . Unit weight of wall w =19.2 kN/m^2, soil is medium.

b. Define bands. At what levels in a masonry building would you provide them? Give justifications for each of them

7. Attempt any *one* part of the following:

a. Starting from fundamentals derive the expression for natural frequencies and amplitudes
for block foundation subjected to horizontal forces $F_x Sin\omega t$ and a moment $M_y Sin\omega t$ at the
combined center of gravity of machine and foundation.

b. Determine the lateral forces on a two-storey unreinforced brick masonry building as shown in figure sustained near Zone III for following data . Plan size =18mx8m , total height of building= 6.2 m , storey height =3.1 m , weight of roof = 2.5kN/m^2, weight of wall =5 kN/m^2, live load on roof=0, live load at floor=1.0 kN/m^2, Zone factor =1.0, importance factor =1.0 , Response reduction factor =1.5, soil (Type III) medium soil.