BACHELOR OF TECHNOLOGY (C.B.C.S.) (2014 COURSE)
B.Tech.Sem - VIII CIVIL :SUMMER- 2022
SUBJECT : EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

Day : Tuesday
Date : 14-06-2022

S-13638-2022

Time : 02:30 PM-05:30 PM
Max. Marks : 60

N.B.

1) All questions are **COMPULSORY**.
2) Figures to the **RIGHT** indicate **FULL** marks.
3) Draw neat and labeled diagram **WHEREVER** necessary
4) Assume suitable data, if necessary.
5) Use of I.S. 1893 Part-I, I.S. 13920, I.S. 456 is allowed.

Q.1 **a)** What are the different layers of earth? How the movements of these layers contribute in creating earthquakes? **(05)**

b) What are different types of earthquake? **(05)**

OR

Q.1 **a)** What are the effects of earthquake? **(05)**

b) Define focus, epicenter, DBE, PGA, magnitude of earthquake. **(05)**

Q.2 **a)** Explain how the earthquake creates inertia force which is subjected to vibration? How it can be idealized as a system with degrees of freedom? **(05)**

b) How the vibrations occurring due to earthquake can be reduced? Which are the measures adopted for it? **(05)**

OR

Q.2 **a)** What are free and forced vibrations? Differentiate between them. **(05)**

b) What are a single degree of freedom system and multiple degree of freedom system? Give suitable examples. **(05)**

Q.3 **a)** What are the parameters on which lateral force due to earthquake depend? How they are accounted for in static method of design? **(05)**

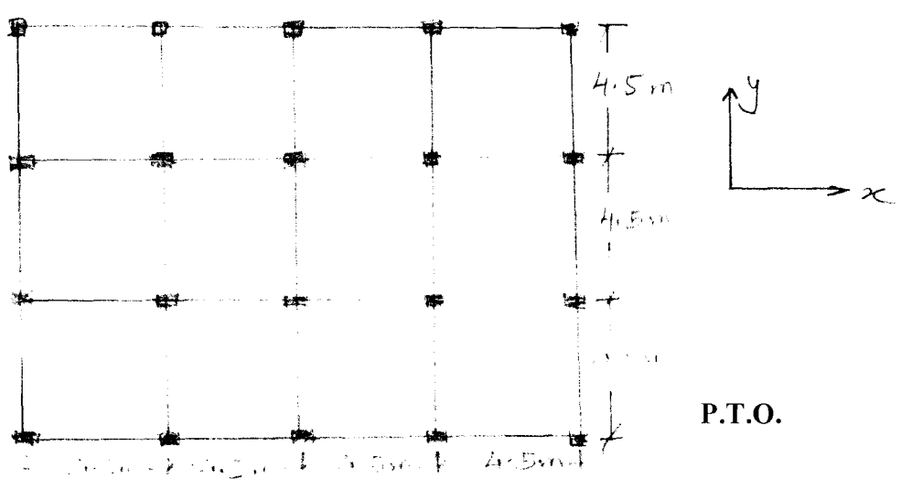
b) What are the basic principles in earthquake resistant design? Why it is called as earthquake 'Resistant' design? **(05)**

OR

Q.3 A four storied hospital building is located at Chandigarh and is founded on hard soil. The building is a steel frame without infilled brick panels and is an ordinary moment resisting frame. **(10)**

Dead load = 3 kN/m^2
Live load = 1 kN/m^2 on roof
Live load = 3 kN/m^2 on each floor
Sizes of beams and columns = 300 mm x 600 mm
Floor to floor height = 3.4 m

Determine the lateral forces due to earthquake by using equivalent static method along x-direction. Draw the lateral force and storey shear diagram.



P.T.O.

Q.4 **a)** In which cases, dynamic method is adopted? **(05)**
b) What is a seismograph? How it is used to determine PGA? **(05)**

OR

Q.4 For the given frame, determine the seismic force using dynamic method. **(10)**
Floor to floor height = 3.5 m
Given z = 0.24, I = 1.5, R = 5
The building is founded on medium stiff soil. The frame is a three storied single bay of width 5 m.

The details of mode shapes are as follows.

Floor level	Weight (kN)	Mode 1 T = 0.46 sec.	Mode 2 T = 0.26 sec.	Mode 3 T = 0.14 sec
3	1700	1.0	1.0	1.0
2	2600	0.66	–0.67	–1.9
1	3800	0.28	–0.5	+1.8

Q.5 **a)** What is the role of shear wall in increasing earthquake resistance of a building? **(04)**
b) Draw the deflected shape of a shear wall. With the help of it, show the various types of reinforcements provided in a shear wall. **(06)**

OR

Q.5 Design a shear wall of a five storied building for following data. **(10)**

Storey	5	4	3	2	1
Lateral force (kN)	650	490	380	270	140

Floor to floor height = 3.5 m
Length of shear wall = 7 m
Axial force on shear wall = 4000 kN
Location of building = Zone IV
Use M 25, Fe 500.

Q.6 **a)** Name the different types of irregularities in a building and explain any one in detail. **(05)**
b) Draw and elaborate the beam-column junction for earthquake resistance design. **(05)**

OR

Q.6 **a)** Explain the special detailing provisions in beams for making the beam ductile. **(05)**
b) Explain 'weak beam-strong column' concept. How it helps to make the building more earthquake resistant? **(05)**

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