JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TERM 2 EXAMINATIONS–2023

M.Tech.–II Semester (Structural Engineering)

COURSE CODE (CREDITS): 12M1WCE213 (3)   MAX. MARKS: 25

COURSE NAME: Earthquake Resistant Design of Structures

COURSE INSTRUCTORS: Sugandha Singh   MAX. TIME: 1 Hour 30 Minutes

Note: There are two pages in the question paper, carefully check beforehand.

- *All questions are compulsory. Marks are indicated against each question in square brackets.*
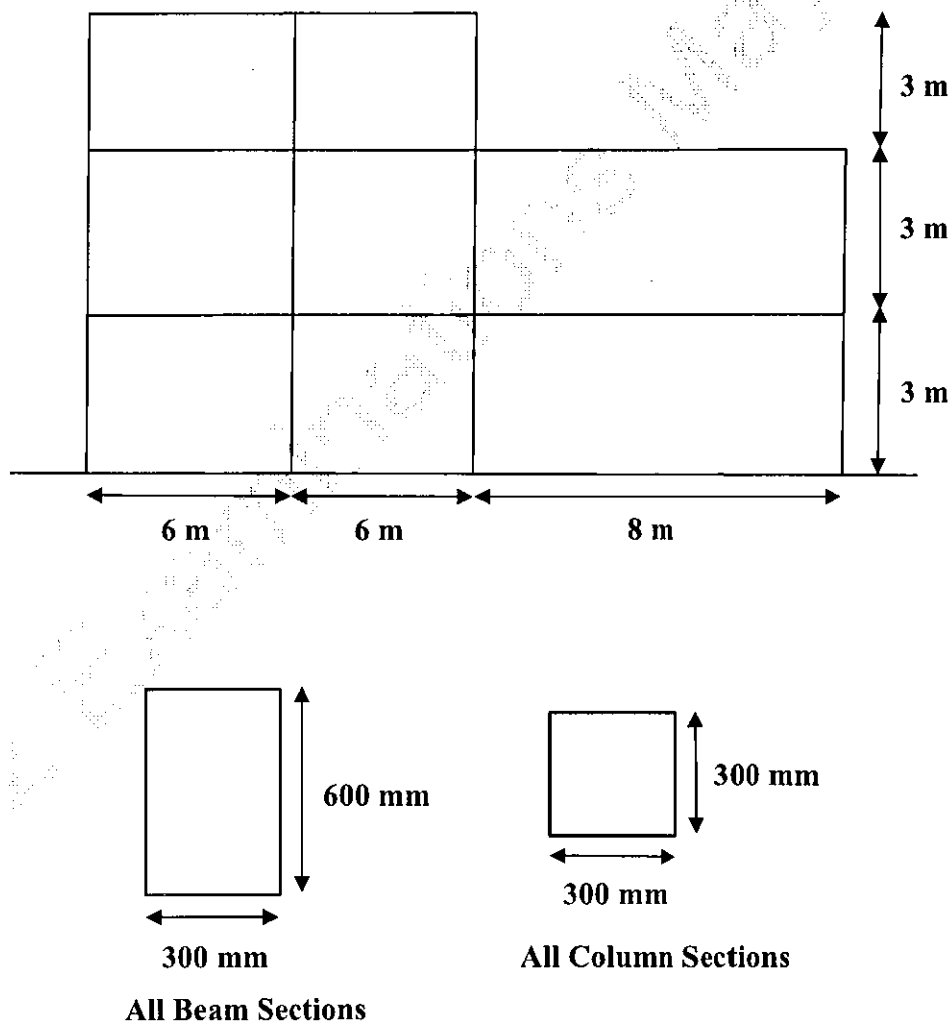- *Print outs of IS 1893:2002 code is available with the invigilators.*

Fig. 1. RC Moment Resisting Frame

1. For the RC structure to be designed with ductile detailing, find the modal periods in seconds and mode shapes. Assume a live load of 4 KN/m^2 on 1st and 2nd floors and 2 KN/m^2 on the 3rd floor. **[6]**

2. Using IS 1893:2002, find the following for the structure in fig.1. Make appropriate assumptions and mention them in your answers. Also mention proper clauses.

   a. Fundamental Time Period (s). Compare it with the fundamental period calculated in the question 1. **[1]**

   b. Assuming that the structure is constructed on a soft soil, find the pseudo-spectral acceleration in 'g' units. **[1]**

   c. Assuming that the structure is a hospital which is being built in Dehradun, find the design horizontal seismic coefficient for the structure. **[2]**

   d. Find the design base shear on the building. **[1]**

   e. Lateral force on every floor. **[2]**

   f. Calculate the modal masses of all modes. How many modes should be considered for proper analysis of the building? **[2]**

   g. List the type of irregularities in the RC frame. **[1]**

3. Answer the following the questions in brief:

   a. What is the need to define Damping Scaling Factors? **[2]**

   b. What is storey drift? What is the allowable limit of storey drift as per IS 1893? **[2]**

   c. What is a RotDNN Spectrum? What is the need of such a spectrum? **[2]**

4. What is Ductility? Derive the Newmark Hall R–μ–T relationship, $R = \sqrt{2\mu - 1}$ using the *Equal Energy Concept*. **[3]**