Prof Verma

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST-3 EXAMINATION, JUNE-2016
M.Tech. (Structural Engineering) II Semester, B.Tech. (Civil) VIII Semester

COURSE CODE: **12M1WCE213** MAX. MARKS: 35
COURSE NAME: Earthquake Resistant Design of Structures
COURSE CREDITS: 3 MAX. TIME: 2 HRS

Note: All questions are compulsory. Assume the missing data, if any.
Marks are indicated against questions.
Carrying of mobile phone during examinations will be treated as case of unfair means.

1. Discuss the role of horizontal band in improving seismic behaviours of brick masonry. Also discuss design and reinforcement detailing of lintel band as per IS-recommendations. **(5)**
2. Why beam-column joints are so important in seismic design? Discuss earthquake behaviour and reinforcement detailing of such joints using sketches. **(5)**
3. What is a shear wall? What are the advantages of using it in seismic design? Discuss ductile design and architectural aspects of shear wall. Show typical detailing of shear wall with boundary elements. **(5)**
4. Calculate storey shear force at each storey due to all modes using response spectrum analysis for the building (**Fig. 1**) without considering effect of infill walls. **(15)**
5. Calculate the modified **K** matrix if infill walls are considered in the calculation of shear force. **(5)**

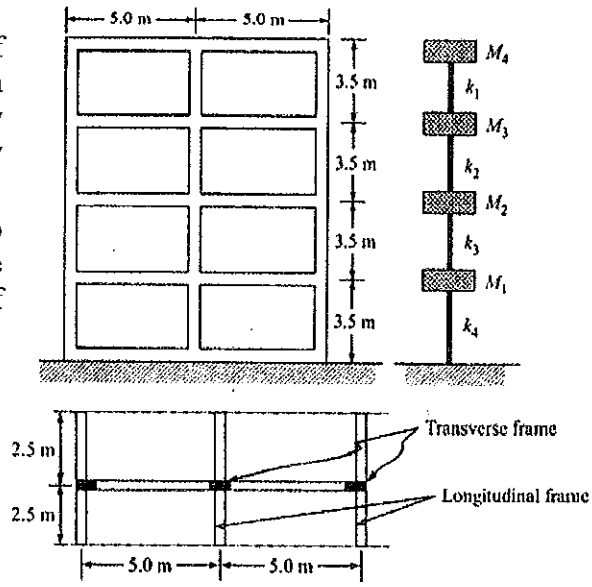

Fig. 1

1.	Type of structure	Multi-storey rigid jointed plane frame (Special RC moment resisting frame)
2.	Seismic zone	IV (Table 2, IS 1893 (Part 1): 2002)
3.	Number of stories	Four, (G+3)
4.	Floor height	3.5 m
5.	Infill wall	250 mm thick including plaster in longitudinal and 150 mm in transverse direction
6.	Imposed load	3.5 kN/m^2
7.	Materials	Concrete (M 20) and Reinforcement (Fe415)
8.	Size of columns	250 mm × 450 mm
9.	Size of beams	250 mm × 400 mm in longitudinal and 250 mm × 350 mm in transverse direction
10.	Depth of slab	100 mm thick
11.	Specific weight of RCC	25 kN/m^3
12.	Specific weight of infill	20 kN/m^3
13.	Type of soil	Rock
14.	Response spectra	As per IS 1893 (Part 1): 2002
15.	Time history	Compatible to IS 1893 (Part 1): 2002 spectra at rocky site for 5% damping

$$\{\Phi\} = \{\Phi_1\ \Phi_2\ \Phi_3\ \Phi_4\} = \begin{bmatrix} -0.0328 & 0.0795 & 0.0808 & -0.0397 \\ -0.0608 & 0.0644 & -0.0540 & 0.0690 \\ -0.0798 & -0.0273 & -0.0448 & -0.0799 \\ -0.0872 & -0.0865 & 0.0839 & 0.0696 \end{bmatrix}$$

E_f = Elastic modulus of frame material = 22360 N/m^2
E_m = Elastic modulus of masonry wall = 13,800 N/m^2
t = Thickness of infill wall = 250 mm
h = Height of infill wall = 3.5 m
l = Length of infill wall = 5.0 m

$$T = \begin{bmatrix} 0.6977 & 0 & 0 & 0 \\ 0 & 0.2450 & 0 & 0 \\ 0 & 0 & 0.1636 & 0 \\ 0 & 0 & 0 & 0.1383 \end{bmatrix} \text{s}$$