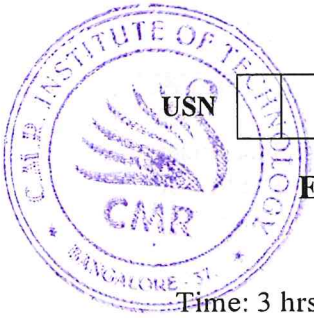# CBCS SCHEME

15CV831

Eighth Semester B.E. Degree Examination, Aug./Sept.2020
Earthquake Resistant Design of Structures

Time: 3 hrs.   Max. Marks: 80

Note: i) For Regular Students: Answer any FIVE full questions irrespective of modules.
ii) For Arrear Students : Answer any FIVE full questions, choosing ONE full question from each module.
iii) Use of IS 1893:2002 is permitted.

Module-1

1 a. Distinguish between Magnitude and Intensity of earthquake. **(08 Marks)**
   b. Explain importance of considering the local site effect in evaluating the earthquake force. **(04 Marks)**
   c. Discus theory of plate tectonics with regards to causes of earthquake. **(04 Marks)**

2 a. Explain seismic zoning map of India with respect to background and use of seismic zoning in computation of seismic forces. **(08 Marks)**
   b. Explain in detail with neat sketches different types of seismic waves and their propagation. **(08 Marks)**

Module-2

3 a. What are the methods to control or modify the structural response to seismic activity? Elaborate any one of them. **(08 Marks)**
   b. Explain strong motion characteristics of an earthquake. **(08 Marks)**

4 a. Explain the tripartite plot of design spectrum and significance of spectral regions. **(08 Marks)**
   b. Differentiate between response history and response spectrum and explain the factors

   influencing the response acceleration $\left[\dfrac{S_a}{g}\right]$ with neat diagrams. **(08 Marks)**

Module-3

5 a. Explain vertical irregularity in general and soft storey in particular with reference to earthquake resistance. Explain special provisions of design of buildings with soft storey. **(10 Marks)**
   b. A building having a non-uniform distribution of mass is shown in the Fig.Q5(b). Locate its centre of mass.
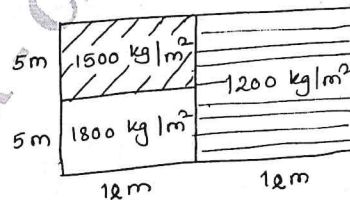

Fig.Q5(b)   **(06 Marks)**

6 a. Explain different lateral load resisting system with sketches. **(10 Marks)**

b. For moment resisting frames idealized as shear buildings. Investigate the building structure shown in Fig.Q6(b) has soft storey or extreme soft storey. M.I of each column is indicated.
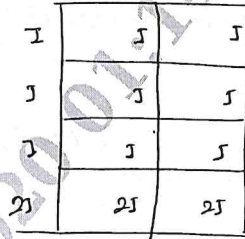

Fig.Q6(b) **(06 Marks)**

Module-4

7   A four storey building of plan shown in Fig.Q7 is located in seismic zone IV. Number of stories − 4 (G + 3) is RCC (SMRF) for office (Importance Factor = 1). The loads on the floors are W_1 (Roof) = 3000 kN; $W_2 = W_3 = W_4$ = 4200 kN (L.L. = 3.5 kN/m^2)
The storey heights are : Ground floor = 4.2 m ; first storey = 3.2 m ; second storey = 3.2 m, third storey = 3.2 m.
The building is founded on rocky site. Compute the seismic forces for each storey by equivalent static lateral force method. [Assume infill walls]
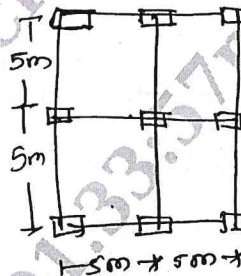

Fig.Q7 **(16 Marks)**

8   For the residential RCC (SMRF) building founded on soft soil and situated in zone V as shown in Fig.Q8, compute the seismic forces for each storey using dynamic analysis procedure given : Free vibration analysis results.
Frequencies : $W = \{47.832 \quad 120.155 \quad 167.0\}$
Modes $\{\phi_1\} = \{1.00 \quad 0.759 \quad 0.336\}$
$\{\phi_2\} = \{1.00 \quad -0.805 \quad -1.157\}$
$\{\phi_3\} = \{1.00 \quad -2.427 \quad 0.075\}$
and $k_1 = k_2 = 160 \times 10^3$ kN/m ; $k_3 = 240 \times 10^3$ kN/m
$w_1 = w_2 = w_3 = 196.2$ kN
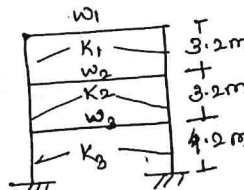Use SRSS modal combination rule.

Fig.Q8 **(16 Marks)**

2 of 3

Module-5

9 a. What are the provisions for increasing the seismic resistance of masonry buildings? Discuss in detail, with sketches, wherever necessary. **(10 Marks)**

 b. Write notes on Failure patterns in Masonry buildings. **(06 Marks)**

10 a. Write a note on / explain Detailing of beam – column joints to enhance ductility as per IS 13920. **(06 Marks)**

 b. Write a note on Retrofitting of Masonry buildings and RC buildings. **(10 Marks)**

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