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Question Paper Code: BST210

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech II Semester End Examinations (Supplementary) - January, 2019

Regulation: IARE–R16

EARTHQUAKE RESISTANT DESIGN OF BUILDINGS

Time: 3 Hours **(STE)** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only
Note: Use of IS 1893:2002 (Part II), IS 1390 is Permitted

UNIT – I

1. (a) Define the magnitude of earthquake. Is it a true measure of damage potential? Why? **[7M]**

   (b) Discuss briefly about the following i) Seismograph ii) Strong ground motion iii)Seismogram **[7M]**

2. (a) Obtain the expression for natural frequency of single degree damped free vibration system. **[7M]**

   (b) Determine the natural circular frequency and natural period of vibration of a system of weight $5x10^4$ N. The lateral stiffness of the system is $3x10^4$ N/m. What is the mass of the system? **[7M]**

UNIT – II

3. (a) Describe the effect of vertical irregularities on the performance of RC buildings during earth quake. **[7M]**

   (b) Describe the effect of plan irregularities on the performance of RC buildings during earth quake. **[7M]**

4. (a) Classify the types of earthquakes according to its depth of 'focus' and explain them. **[7M]**

   (b) "Simplicity and symmetry are the key to making a building earthquake resistant". Justify the statement by explaining the concept with neat sketches. **[7M]**

UNIT – III

5. (a) State the assumptions made in analysis of earthquake resistant design of buildings **[7M]**

   (b) Briefly explain the procedure of seismic coefficient method of analysis. **[7M]**

6. (a) Briefly explain the procedure to calculate the seismic weight of buildings **[7M]**

   (b) A 3-storeyed RCC special moment resisting frame (SMRF) conforming to ductile detailing provisions residential building with importance factor 1 is located in zone V. The height of each storey is 3m. The area of each floor is $576m^2$ with a dead load as $2kN/m^2$. The live load on roof is $1.5kN/m^2$. The structure is on medium soil. The damping in the structure is estimated to be 8.5%. Determine the design seismic forces on the structure by equivalent static force method. **[7M]**

UNIT – IV

7. (a) Give details about the procedure for design of shear walls as per IS 13920:1993. **[7M]**

   (b) Design a Rectangular beam for 6m span to support a dead load of 15kN/m and a live load of 20kN/m inclusive of its own weight. Moment due to Earthquake load is 120kN-m and shear force is 80kN. Use M20 grade concrete and Fe 415 steel. **[7M]**

8. (a) For the typical 3 storey building having two bays of length 6mts in X and Z directions. The height of the building is 9mts with 3 stories each of 3mts. Calculate the lateral forces using code based method for the following details. **[7M]**

   Seismic zone : IV, floor and roof slab thickness : 150mm,

   Beam size: 300 x 450mm, Column size : 400mm x 400mm,

   wall thickness : 230mm (internal and external) and Live load 4 kN/m^2. (follow IS 1893:2002 code)

   (b) A four storey RC frame building is situated in seismic zone-4. The height between the floors is 3m and total height of building is 12 m. The dead and normal live load is lumped at respectiive floor. The soil below the foundation is assumed to be hard rock. Assume building is intended to be used as a hospital. Determine the total base shear as per IS 1893(part-1):2002. **[7M]**

UNIT – V

9. (a) Briefly explain about the damages and non damages of masonry structures. **[7M]**

   (b) Discuss the effect of openings on the seismic performance of masonry buildings. **[7M]**

10. (a) Explain the design procedure of two storey masonry buildings with examples. **[7M]**

    (b) Define Bands? At what levels in masonry buildings would you provide them? Give justification for each of them. **[7M]**

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