Date: 15/11/2016.

Student Exam No._____

GANPAT UNIVERSITY

B. Tech. Semester: VII (CIVIL) Engineering

Regular Examination Nov-Dec 2016

2CI708 : DESIGN OF EARTHQUAKE RESISTANT STRUCTURES - I

Time: 3 Hours / As per Scheme   Total Marks: 70

Instructions:
    (1) This Question paper has two sections. Attempt each section in separate answer book.
    (2) Assume suitable data if required and mention it clearly.
    (3) Figures on right indicate marks.
    (4) Be precise and to the point in answering the descriptive questions.
   (5) IS 1893 (Part-1) : 2002 and IS 875 (Part-3) : 1987 is allowed

Section - I

Que.-1   **(A)**   A vibrating system consist of a mass 50 kg. A spring of stiffness 30 kN/m   **(06)** and a viscous damper. For the following conditions, find the equation for the displacement at any instant of time. Assume critically damped system. The initial displacement and velocity given as 5 cm and 0 m/s respectively and the system is released. Also find the time taken by the mass to reach at 5 mm from the equilibrium on return after releasing the system.

       (B)   Derive the equation of motion for single degree free undamped vibration   **(04)**

       (C)   Differentiate strength and stiffness.   **(02)**

OR

Que.-1   **(A)**   An empty elevated water tank is pulled by a steel cable by applying   **(06)** 30 kN force horizontally and displaced by 5 cm. the cable is suddenly cut and resulting free vibration is recorded at the end of the 5 complete cycles the time is 2.0 sec and the amplitude is 2 cm. Determine damping ratio, natural period of Undamped vibration, effective stiffness, effective weight and damping coefficient

       (B)   Define damping and explain its type   **(04)**

       (C)   Differentiate between vibration and oscillation   **(02)**

Que.-2 (A) Define the term load and give classification of loads. (03)

(B) Define centre of mass and centre of stiffness (02)

(C) Calculate the lateral force in the walls of the one storey building due to (06)
a lateral force of 350 kN applied in Y-direction and 250 kN in X-direction and passing through the centre of mass. The roof diaphragm is rigid in its own plane and mass at the roof is uniformly distributed. Check for torsionally couple-uncouple.
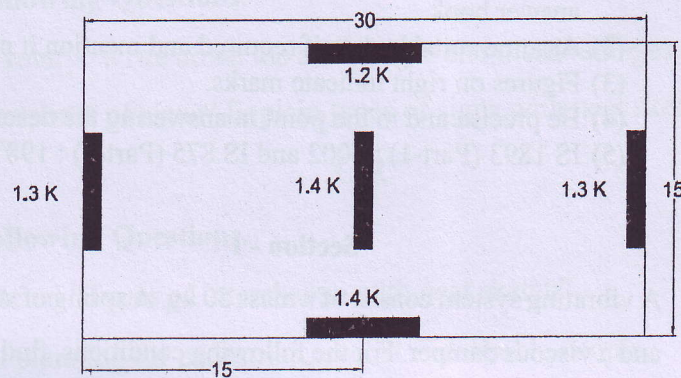
OR

Que.-2 (A) A five storey building has size of 30 m × 30 m. it is located in bhuj and (08)
resting on hard soil the weight of floors and height of the floor are 2000 kN, 2500 kN, 2500 kN, 2500 kN and 2100 kN and 4.5 m, 3.5 m, 3.5 m 3.5m and 3.5 m respectively from slab number 1 from bottom. Assuming the building as special moment resisting office building. Calculate the horizontal shear forces acting at the slab level by equivalent lateral force method.

(B) Explain degree of freedom (03)

Que.-3 Calculate natural frequency and corresponding mode shapes for the (12)
system as for the given data. Mass $m_1 = 23625$ kg. $m_2 = 11475$ kg and stiffness $k_1 = 5526$ kN/m, $k_2 = 7974$ kN/m.

Section – II

Que.–4 (A) Define terminology: Focus, Epicenter, Epicentral distance, Focal depth, Main Shock and Aftershocks (06)

(B) Write a short note on magnitude and intensity. (06)

OR

Que.–4 (A) How architectural features affect building during earthquake? (06)

(B) Explain earthquake design philosophy in detail. (06)

Que.–5 (A) Explain the behavior of beam-column junction during earthquake. (05)

(B) Explain with figure ductile detailing of beam as per IS:13920:1993 (06)

OR

Que.-5 (A) Explain the behavior of brick masonry wall during earthquake. (05)

(B) Explain the design of horizontal band with net sketch (06)

Que.-6 (A) What are the preventive measures for liquefaction? (06)

(B) What is seismic retrofitting? Give the classification of retrofitting and explain any one method of retrofitting. (06)

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