USN

10CV767

Seventh Semester B.E. Degree Examination, June/July 2018
Structural Dynamics

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define the following terms :
   i) Focus of an earthquake
   ii) Epicenter of an earthquake
   iii) Magnitude of an earthquake
   iv) Intensity of an earthquake **(06 Marks)**

b. Derive the equation for response an under-damped single degree of freedom system subjected to free vibration using standard notations. **(14 Marks)**

2 a. A simply supported beam of span 3m having a central mass of 20 tons is subjected to a harmonic load of 10 sin 15t kN as shown in Fig. 2(a). Take Young's modulus = 200×10^9 N/m^2, damping ratio = 5% moment of inertia = 66.67×10^6 mm^4. Determine undamped natural frequency damped natural frequency, coefficient of damping, coefficient of critical damping, steady state amplitude and Dynamic Magnification factor (DMF). **(12 Marks)**

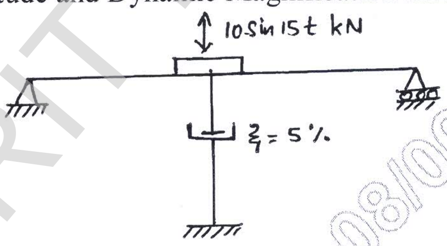

Fig Q2(a)

b. A body of mass 10kg is supported on a spring of stiffness 300N/m and has a dashpot connected to it which offers a resistance of 0.04N at a velocity of 0.02m/s. In what ratio, will the amplitude of vibration reduces after 5 cycles? **(08 Marks)**

3 a. Derive an expression for response of a single degree of freedom system subjected to a constant force. **(10 Marks)**

b. Drive an expression for response of a single degree of freedom system subjected is harmonic base excitation. **(10 Marks)**

4 a. State and prove orthogonality principle of normal modes. **(10 Marks)**

b. Formulate equation of motion for the following systems shown in Fig Q4b(i) and Fig Q4b (ii) **(10 Marks)**

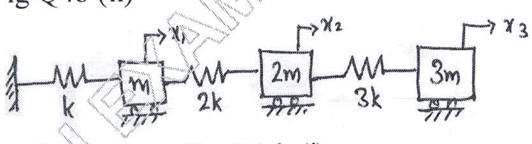

Fig Q4-b (i)

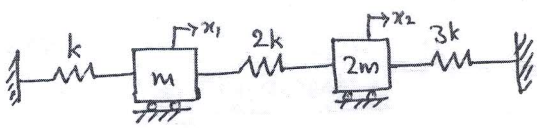

Fig Q4-b (ii)

PART – B

5 Calculate the natural frequencies and mode shapes for the shear building shown in Fig Q5. **(20 Marks)**

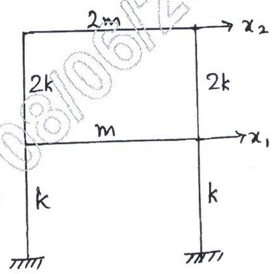

Fig Q5

6 Compute the steady state response of the shear building shown in Fig Q6. **(20 Marks)**

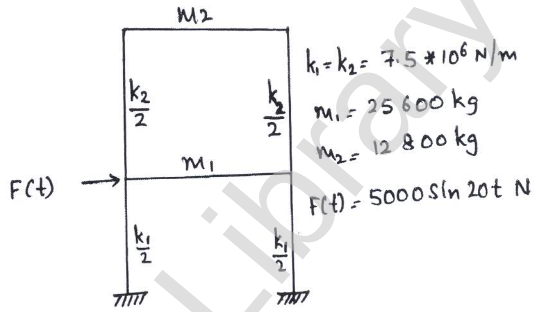

Fig Q6

7 Determine the response f the two storey shear building which is viscously damped as shown in Fig Q7, by using modal superposition method, at time t = 0.1 second. **(20 Marks)**

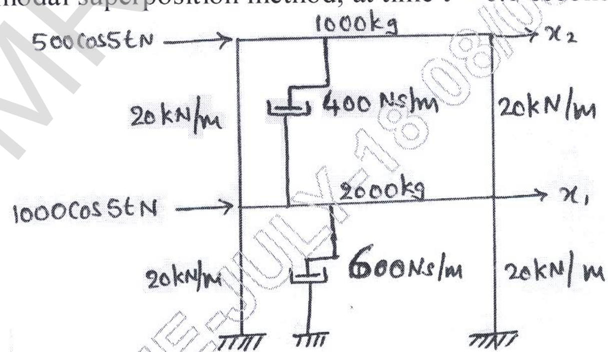

Fig Q7

8 Determine the natural frequency for a fixed beam as shown in Fig Q8 by discreditizing into two elements. Take flexural rigidity EI = 10Nm^2, length of each element = 2m and $\rho = 2$. **(20 Marks)**

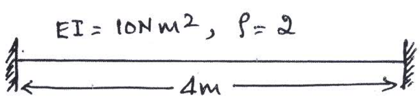

Fig Q8

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