Total No. of Questions : 8]

SEAT No. :

P3840

[Total No. of Pages : 3

[5462]-538

M.E. (Civil - Structures)

STRUCTURAL DYNAMICS

(2017 Pattern) (Semester - I) (End - Semester)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) *Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.*
2) *Neat diagram must be drawn wherever necessary.*
3) *Figures to the right indicates full marks.*
4) *Assume suitable data, if necessary and clearly state.*
5) *Use of cell phone is prohibited in the examination hall.*
6) *Use of electronic pocket calculator is allowed.*

Q1) a) Derive and explain governing second order differential equation of motion for undamped vibrations. **[3]**

b) A damped system has following elements Mass = 4 kg; k = 1 kN/m; C= 40 N-sec/m. **[6]**

Determine:

i) Natural frequency of damped oscillation.

ii) Damping factor.

iii) Logarithmic decrement.

iv) Number of cycles after which the original amplitude is reduced to 20%.

OR

Q2) a) Derive the expression for logarithmic decrement. **[4]**

b) A mass of 5 kg travelling inside the cylinder with velocity of 15 m/s and hits the spring & damper. Determine Maximum displacement of mass after hitting. (The system starts from zero). **[5]**

Q3) a) Explain Duhamel's integral. **[4]**

b) Determine the natural frequency and period of vibration of the system shown in Fig 1. Assume the beam is mass less. If the initial displacement of mass is 25mm and velocity 500mm/sec. Determine displacement after 1 sec. Take m=1000 kg, K= 10,000 N/m, L=2m, EI=l000kN-m^2. **[5]**

P.T.O.

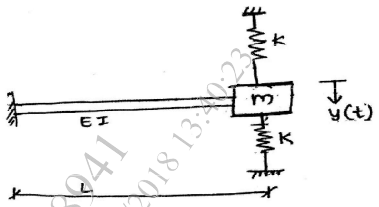

Fig. 1

OR

Q4) a) Explain constant acceleration method and linear acceleration method. **[5]**

b) A building frame is modelled as an undamped SDOF system as shown in Fig. 2 (a). Find the response of the frame if it is subjected to a blast loading which is in Fig. 2 (b). **[4]**

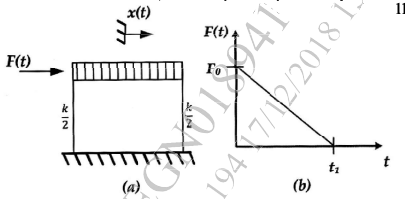

Fig. 2

Q5) a) Explain mass coupling, velocity coupling and elastic coupling with a suitable example. **[8]**

b) For the system shown in Fig. 3, obtain the natural frequencies and mode shape. Take $m_1=m_2=m_3=5$ and $k_1=k_2=k_3=2$. **[8]**

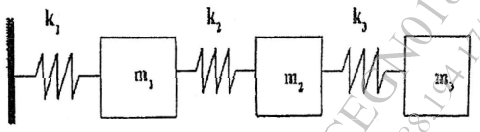

Fig. 3

OR

Q6) a) What are mode shapes? Give suitable examples. **[7]**

b) Determine the eigenvalues and eigenvectors for the system shown in **[9]**

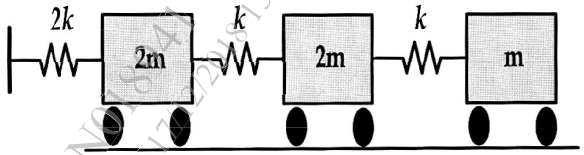

Fig. 4

Q7) a) Obtain the equation of motion for transverse vibration of a simply supported beam of length 1 and having a uniform cross-section. **[8]**

b) Determine the equation of motion for transverse vibration of a uniform beam fixed at one end and simply supported at the other end. **[8]**

OR

Q8) a) What is the difference between the finite element method and the Rayleigh-Ritz method? **[8]**

b) Explain Rayleigh — Ritz method. **[8]**

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