Reg. No. : | | | | | | | | | | |

Question Paper Code: 42611

M.E. DEGREE EXAMINATION, MAY 2017

First Semester

Structural Engineering

14PSE101 – STRUCTURAL DYNAMICS

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (5 x 1 = 5 Marks)

1. Square root of mass per stiffness is called as
   (a) natural frequency (b) damping coefficient
   (c) fundamental frequency (d) logarithmic decrement

2. _____is mainly concerned with finding out the behavior of a physical structure when subjected to force.
   (a) Structural analysis (b) Structural dynamics
   (c) Dynamic displacements (d) All the above

3. Which method is most approximate method using multi degree freedom system?
   (a) holzer method (b) stodoloa's method
   (c) both (a) and (b) (d) None of the above

4. The _____is a widely used method used to approximate eigen values and eigen vectors.
   (a) Rayleigh–Ritz method (b) Eigen method
   (c) Numerical method (d) None of these

5. Non linear analysis of SDOF system has been solved using a step by step linear acceleration method

(a) Continuous sytem (b) Wilson Θ method

(c) Direct integration method (d) New mark beta method

PART - B (5 x 3 = 15 Marks)

6. State Hamilton's principle.

7. Differentiate undamped free vibration and undamped forced vibration.

8. Define mode superposition.

9. Differentiate linear and nonlinear vibration.

10. What is the principle involved in direct integration schemes?

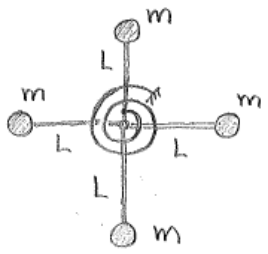
PART - C (5 x 16 = 80 Marks)

11. (a) A free vibration test was conducted on a SDOF System. It is observed that 60*mm* initial displacement was given by applying a horizontal force of 80*KN* through the cable and then cutting the cable suddenly after 6 complete cycles which is assumed to be 3 *sec*. The amplitude was found to be 90*mm*. Find the following (16)

(i) Damping ratio.
(ii) Damping co- efficient.
(iii) Damped period of vibration.
(iv) Number of cycles required for the amplitude to decay 3*mm*.
(v) Logarithmic decrement.

Or

(b) A simple model of a fan is made up of four (weightless) rigid bars and four point masses as shown in below figure. The bars are rigidly connected to each other and attached to a frictionless joint. A torsion spring with the spring constant $k\theta$ (*Nm/rad*) is connected to the bars in the joint. Determine the equation of motion and the natural frequency of the system. (16)



12. (a) Determine the modes of vibration and also the steady state response of the given system in Figure.1. (16)

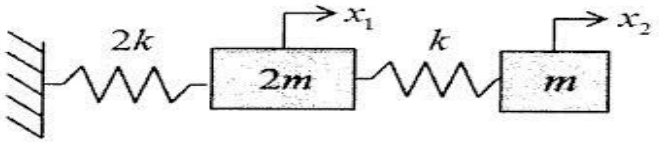


Figure. 1

Or

(b) Show that the displacement of a critically damped system due to initial displacement u_0 and velocity u_0. (16)

13. (a) Calculate the first three frequencies of axial vibration of a bar fixed at one end. (16)

Or

(b) For a two stored frame with viscous damping shown in Figure. 3. Determine displacement by mode superposition method. The stiffness is equal for all story it is 50 *kN/m*. (16)

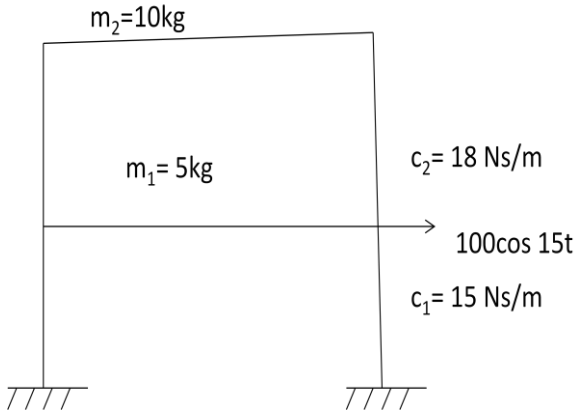


Figure. 3

14. (a) Determine the natural frequency and natural mode shape of uniform beam fixed at one end and hinged at other end subjected to free flexural vibrations. (16)

Or

(b) A mass '*m*' is attached at the midpoint of a beam of length '*l*'. The mass of the beam is small in compression to '*m*'. Determine the spring constant and frequency of free vibration of the beam in vertical direction. The beam has uniform flexural rigidity EI. (16)

15. (a) Write down step by step procedure of numerical integration techniques. (16)

Or

(b) Write short notes on (16)

(i) Wilson Θ method

(ii) The central difference method

(iii) Direct integration method

(iv) Finite difference method