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06CE6027/06CE6021   Reg. No _____

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A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY
M.TECH DEGREEEXAMINATION, DECEMBER 2016

FIRST SEMESTER
Branch: Structural Engineering and Construction Management/Computer Aided Structural Engineering

Structural Dynamics

Time: 3 Hours   Max. Marks: 60

PART A
Answer ALL questions

1. What is D' Alemberts principle? Explain how the principle is employed in vibration problems.
2. Explain Duhamel's integral in evaluating response of a structure.
3. What is the orthogonality criteria for normal modes?
4. Derive the expression for dynamic response of continuous system by Rayleigh's method

                                           (4 x 5 marks =20 marks)

PART B

5. Obtain an expression for the natural frequency of oscillations of a simple pendulum.

                                    OR

6. Calculate the natural angular frequency in side sway for the frame of weight 30 MN shown in the Fig. and also the natural period of vibration. If the initial displacement is 25 mm and the initial velocity is 25 mm/s, what is the amplitude and displacement at t=1 sec? Take EI=12.5 GN-m^2. Length of column member is 1.0m
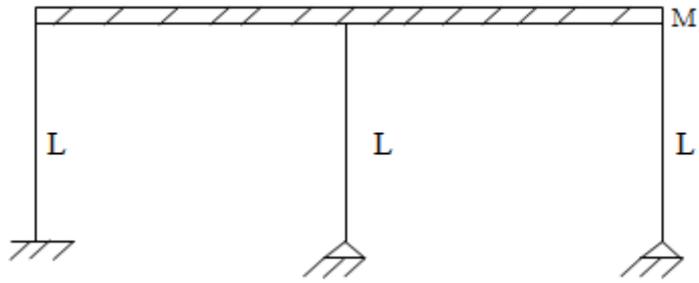
7. Derive an expression for the force transmitted to the foundation and phase angle for a damped oscillator idealized as a SDOF system subjected to harmonic loading.

OR

8. (a) What is logarithmic decrement ? **(3 marks)**

(b) A damped free vibration test is conducted to determine the dynamic properties of a one storey building. The mass of the building is 8000 kg. Initial displacement of the building is 0.6 cm. Maximum displacement on first cycle is 0.5cm and period of this displacement is 1.5s. Determine the effective weight, undamped frequency, logarithmic decrement, damping ratio, damping coefficient, damped frequency and amplitude after 5 cycles. **(7 marks)**

9. Explain the step by step procedure of the analysis of a multi degree of freedom system by the method of mode super position
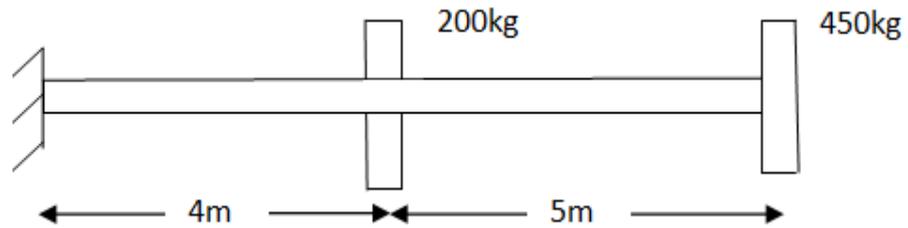
OR

10. Determine the natural frequency and mode shapes of a uniform beam having both ends free

11. Using Stodola method, obtain frequencies and modes of vibration of the frame shown in the following figure.
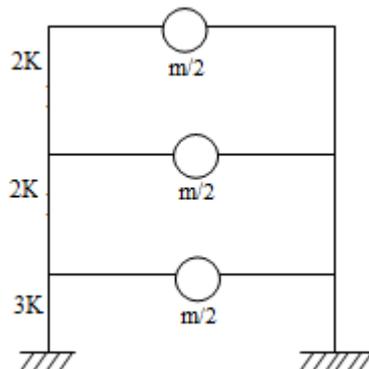
12. Determine the fundamental natural frequency of the shaft carrying masses as shown in Fig. 3 below using Dunkerley's method and compare the same using Rayleigh's method.

(4 x 10 marks =40 marks)