APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M. TECH DEGREE EXAMINATION

Civil Engineering

(Structural Engineering and Construction Management)

04CE6411—Structural Dynamics

Max. Marks : 60 Duration: 3 Hours

PART A

Answer All Questions

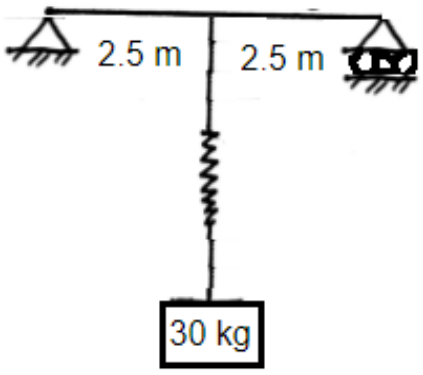
Each question carries 3 marks

1. Explain the principle of virtual work.
2. Differentiate between coulomb and viscous damping.
3. Explain Duhamel's Integral.
4. Write a brief note on modal analysis
5. Explain normal mode shapes
6. Enumerate the boundary conditions for longitudinal vibration of a bar.
7. Write short notes on Stodola's method.
8. Explain Rayleigh-Ritz method

PART B

Each question carries 6 marks

9. Find natural frequency of the system shown in figure. The mass of beam is negligible to suspended mass. Take E= $2x10^5$ N/mm^2. The cross section of the beam b=150 mm and d=200 mm.



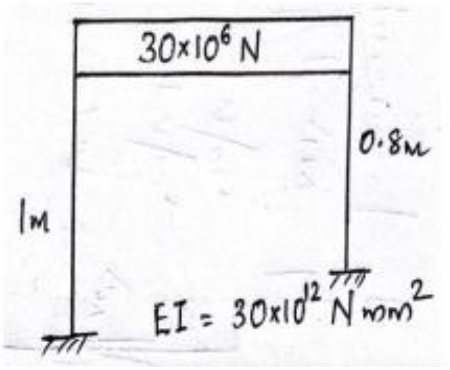
OR

10. Explain vibration control.

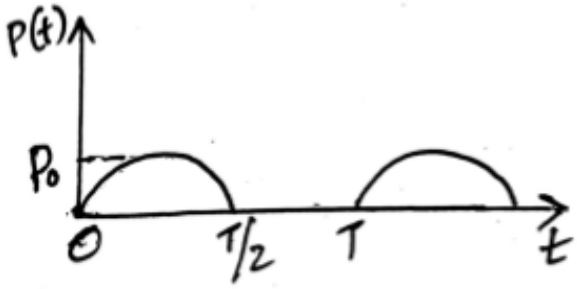
11. An elevated water tank carrying a load of 2700kN fully filled is supported by a massless column of height 10m, with inner and outer diameter 25cm and 30cm respectively. Find the natural frequency and period if modulus of elasticity is 22GPa. Also, determine the vibration response, maximum velocity and maximum acceleration if initial displacement is 25.4cm

OR

12. Find the amplitude and displacement at 1sec of the frame shown, if initial displacement is 25mm and initial velocity is 25mm/s.



13. Find the response for an damped system subjected to the loading as shown



OR

14. Suggest a suitable design such that the force transferred to machine foundation is minimum
15. Show that the mode shapes of a two degree system are orthogonal.

OR

16. A steel rod of diameter 15mm having length 3m is hinged at its both ends. Find the first three natural frequencies of transverse vibration. Also find the mode shapes. Take density of steel as 7850kg/m3 and modulus of elasticity as 200 GPa.
17. A rectangular bar of length, L and uniform cross-section is free at both ends. Derive suitable expression for longitudinal vibrations.

OR

18. Determine the frequency equation for transverse vibration of a uniform beam fixed at both ends.
19. A simply supported beam of negligible weight and length 1.2m carries three transverse loads 200N, 800N and 400N at a distance of 0.3m, 0.6m and 0.9m from the left support. Find the frequency of transverse vibration by Dunkerley's method

OR

20. Determine the natural frequencies of the system shown in figure using matrix method