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Question Paper Code: 1016177

B.E. / B.Tech. DEGREE EXAMINATIONS, NOV / DEC 2024
Sixth Semester
Aeronautical Engineering
U20AE602 – VIBRATION AND ELEMENTS OF AERO ELASTICITY
(Regulation 2020)
(Common to Aerospace Engineering)

Time: Three Hours

Maximum: 100 Marks

Answer ALL questions

PART – A

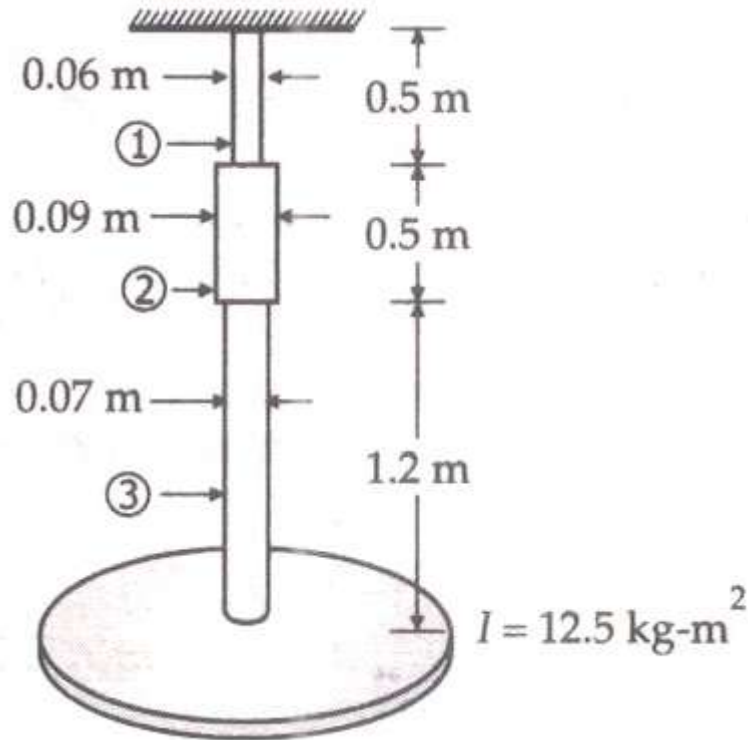
(10 x 2 = 20 Marks)

1. Differentiate periodic and harmonic motion.
2. State D'Alembert's Principle.
3. What kind of material is used for vibration absorber?
4. Differentiate static and dynamic couplings.
5. Distinguish between continuous system and discrete system.
6. Define Longitudinal vibration.
7. What are the applications of Rayleigh's method?
8. Write the advantages of matrix iteration method.
9. What do you mean by aeroelastic instability?
10. Define buffeting.

PART – B

(5 x 16 = 80 Marks)

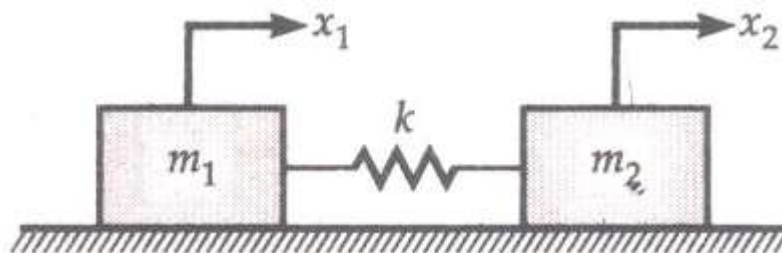
11. (a) Find the natural frequency of torsional vibrations for the system shown in figure below, Neglect the inertia effect of the shaft. Take $G=0.80 \times 10^{11} \text{ N/m}^2$. (16)



(OR)

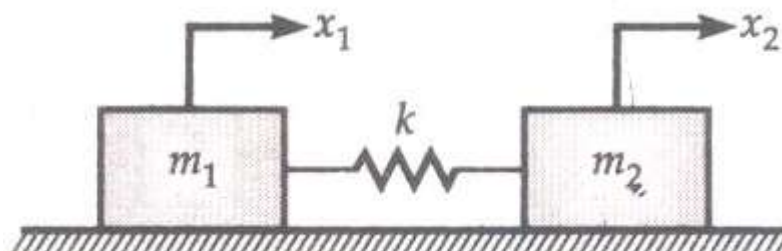
- (b) Describe the various vibration measuring instruments. (16)

12. (a) Solve the problem shown in figure below $m_1=10\text{kg}$, $m_2=15\text{kg}$ and $k=320\text{N/m}$. (16)

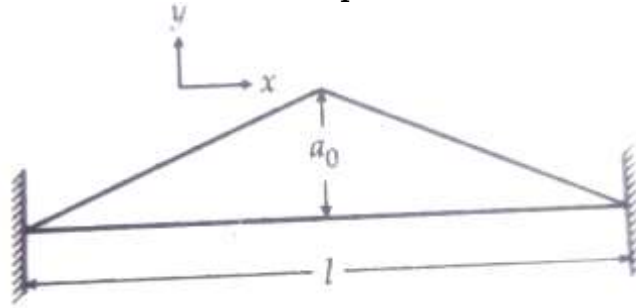


(OR)

- (b) Use Lagrange's equation to find equations of motion for a system shown in Figure below. (16)



13. (a) A uniform string of length L and a large initial tension S , stretched between two supports, is displaced laterally through a distance a_0 at the centre as shown in figure and is released at $t = 0$. Find the equation of motion for string. (16)



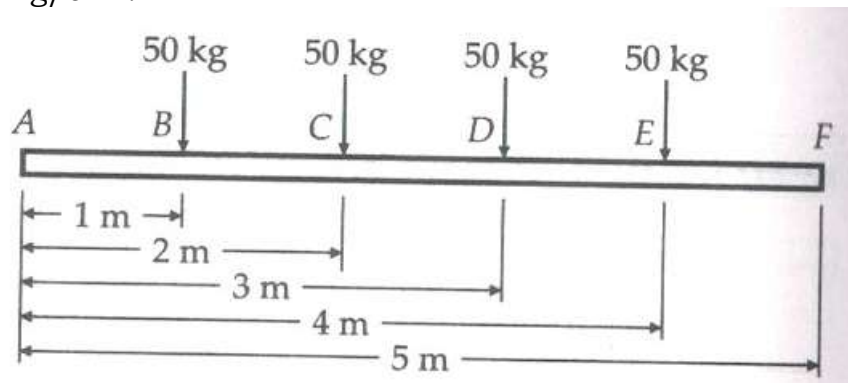
(OR)

- (b) Derive suitable expression for longitudinal vibrations for a rectangular uniform cross section bar of length L fixed at one end and free at the other end. (16)

14. (a) Derive and describe Rayleigh's method using an example of your choice. (16)

(OR)

- (b) A shaft of negligible weight 6cm diameter and 5 m long is simply supported at the ends and carries four weights 50kg each at equal intervals over the length of the shaft. Find the frequency of vibration by Dunkerley's method. Take $E = 2 \times 10^6 \text{ kg/cm}^2$. (16)



15. (a) With the help of collars triangle, explain various types of aeroelastic phenomena. (16)

(OR)

- (b) Consider a 2D wing with the aileron attached. Derive and obtain an expression for the aileron control reversal. (16)

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