R05 SET-4

Code No : 37148

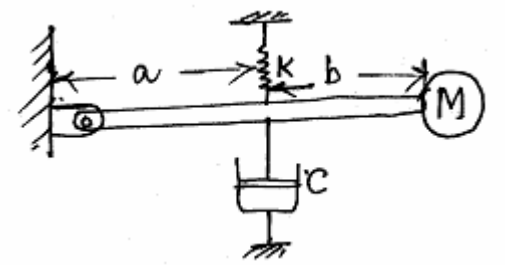
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
IV.B.TECH - I SEMESTER REGULAR EXAMINATIONS NOV/DEC, 2009
THEORY OF VIBRATIONS AND AEROELASTICITY
(AERONAUTICAL ENGINEERING)

Time: 3hours **Max.Marks:80**

Answer any FIVE questions
All questions carry equal marks

\- - -

1. a) What are the components of viscous damped vibrations?
   b)



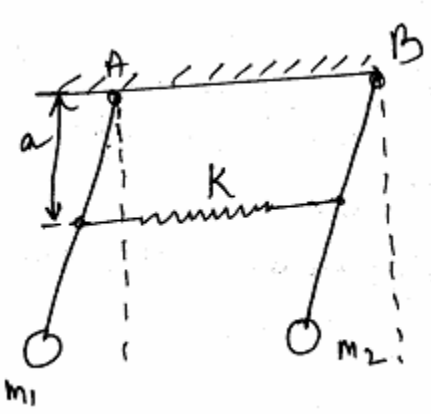
Derive the equation of motion for the system above and determine the damping coefficient under critical damping. [6+10]

2. a) Derive the amplitude equation for a rotating unbalanced mass when the unbalanced mass, m_0 is rotating at eccentricity of 'e' in a machine of mass 'M' with an angular velocity 'ω' $rad/seconds$.
   b) Prove that the amplitude at resonance for the above situation as

$$A_{resonance} = \frac{m_0 e}{2M\xi}$$

where ξ is the damping ratio.
Also draw the characteristic curve for amplitude versus frequency ratio for various 'ξ' values. [10+6]

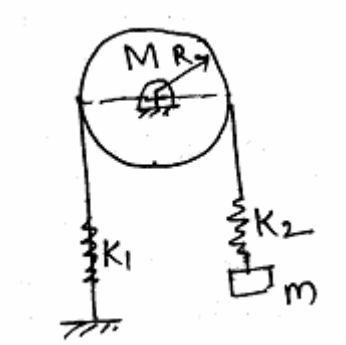
3.



Consider two pendulums of length L shown. Determine the natural frequency of vibration for the given data K = 100 N/m , $m_1 = 2\ kg$, $m_2 = 5\ kg$, L = 0.2 m , a = 0.1m.

[16]

4.

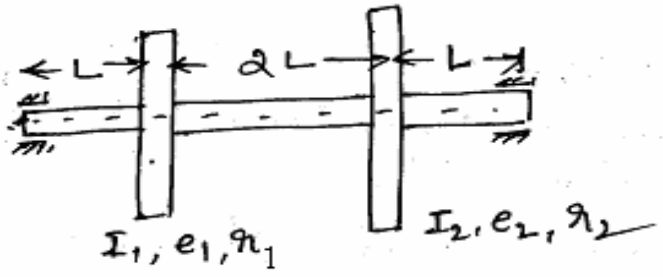


Determine the natural frequency of vibration for the system shown. Assume there is no slip between the cord and cylinder. [16]

5. a) Determine the governing equation for continuous torsional vibrations of a uniform shaft
   b) Develop the solution equation for the above case and give different end conditions possible.

[8+8]

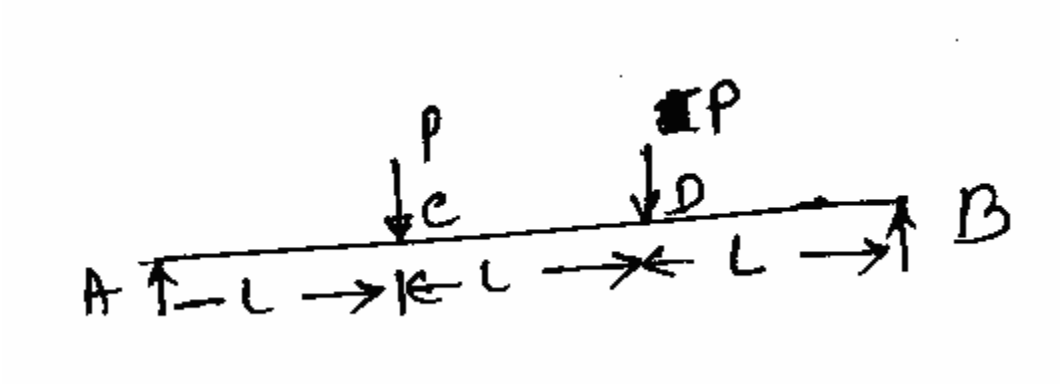
6



Two discs of eccentricities e_1 and e_2 are mounted as shown in the figure. Determine the critical speed. [16]

7. a) Explain the Dunkerley's method of determining the frequency transverse vibrations frequency when a system is subjected to multiple point loads.

b)



Determine the natural frequency of vibration for the above system using Dunkerley's method. [6+10]

8. a) Explain collar's using triangle
   b) Explain aileron effectiveness and reversed. [6+10]

*****