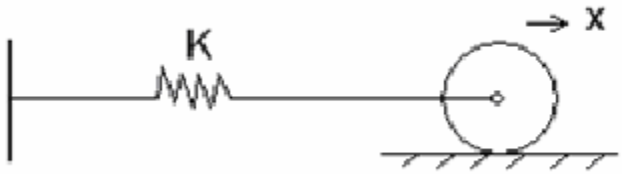
Code.No: R05412402 | R05 | SET-1

IV B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010
VEHICLE DYNAMICS
(AUTOMOBILE ENGINEERING)

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

Answer any FIVE questions
All questions carry equal marks
- - -

1. a) A circular cylinder of mass 2kg and radius 8cm is connected by a spring of stiffness 2000 N/m as shown in figure below. It is free to roll on horizontal rough surface without slipping, determine the natural frequency.



b) A spring mass system has a period 0.2sec what will be the new period if the spring constant is increased by 45%. [8+8]

2. The disc of a torsional pendulum has a moment of inertia of 800 kg cm^2 and is immersed in a viscous fluid. The brass shaft attached to it is of 12 cm diameter and 40 cm long. When the pendulum is vibrating, the observed amplitudes on the same side of the rest position for successive cycles are 10^0, 8^0 and 6^0. Determine:
   a) Logarithmic decrement
   b) Damping torque at unit velocity, and
   c) The periodic time of vibration. Take G = 4.4 x 10^{10} N/m^2. [16]

3. a) What do you mean by vibration Isolation? Explain with neat diagram.
   b) An industrial machine weighing 485 kg is supported on a spring with a statical deflection of 0.6 cm. If the machine has a rotating unbalance of 28 kg-cm, determine the force transmitted at 1300 rpm and the dynamic amplitude at that speed. [6+10]

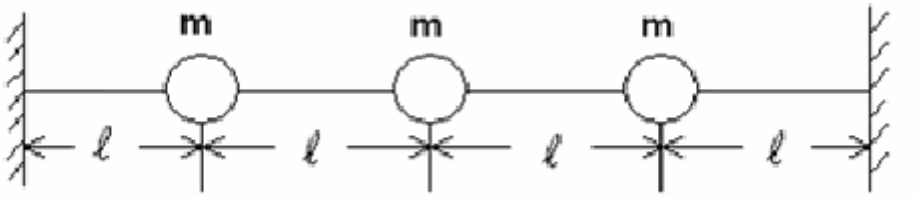
4. a) Explain the functioning of accelerometer with suitable diagram.
   b) A rotor having a mass of 5 kg is mounted midway on a 1 cm diameter shaft supported at the ends by two bearings span is 40 cm. Because of certain manufacturing inaccuracies, the CG of the disc if 0.02 mm away from the geometric centers of the rotor. If the system rotates at 3000 rpm, find the amplitude of steady state vibrations and the dynamic force transmitted to the bearings. Neglect damping and take E = 1.96x10^{11} N/m^2. [6+10]

5. An automobile of mass 2500 Kg has a wheel base of 3.2 meters. Its center of gravity is located 1.5 meters behind the front wheel axis and has a radius of gyration about its center of gravity as 1.1 meter. The front springs have a combined stiffness of 5.88×10^6 N/m and rear springs 6.37×10^6 N/m. Find the principal modes of vibration of the automobile, and locate the nodal points for each mode. Check the two natural frequencies by considering the system, in turn, to be pivoted about the nodal points. [16]

6. Write a note on the following:
   a) Road roughness and its effect on the automobile.
   b) Balancing of the engine. [8+8]

7. Explain the following with neat diagrams:
   a) Forces acting on tyres of a car.
   b) Tyre-road inter action. [8+8]

8. a) Explain Dunkerley's equation by considering suitable system.
   b) Using matrix iteration, find the natural frequency of the system as shown in following figure. (equal masses equally spaced on strings). [16]



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Code.No: R05412402 | R05 | SET-2

IV B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010
VEHICLE DYNAMICS
(AUTOMOBILE ENGINEERING)

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

Answer any FIVE questions
All questions carry equal marks
- - -

1. a) What do you mean by vibration Isolation? Explain with neat diagram.
   b) An industrial machine weighing 485 kg is supported on a spring with a statical deflection of 0.6 cm. If the machine has a rotating unbalance of 28 kg-cm, determine the force transmitted at 1300 rpm and the dynamic amplitude at that speed. [6+10]

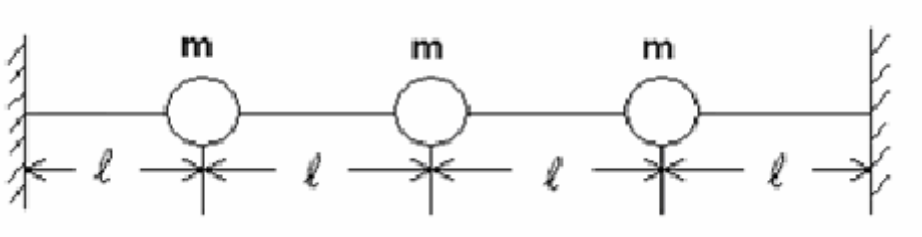
2. a) Explain the functioning of accelerometer with suitable diagram.
   b) A rotor having a mass of 5 kg is mounted midway on a 1 cm diameter shaft supported at the ends by two bearings span is 40 cm. Because of certain manufacturing inaccuracies, the CG of the disc if 0.02 mm away from the geometric centers of the rotor. If the system rotates at 3000 rpm, find the amplitude of steady state vibrations and the dynamic force transmitted to the bearings. Neglect damping and take $E = 1.96 \times 10^{11}$ N/m^2. [6+10]

3. An automobile of mass 2500 Kg has a wheel base of 3.2 meters. Its center of gravity is located 1.5 meters behind the front wheel axis and has a radius of gyration about its center of gravity as 1.1 meter. The front springs have a combined stiffness of 5.88×10^6 N/m and rear springs 6.37×10^6 N/m. Find the principal modes of vibration of the automobile, and locate the nodal points for each mode. Check the two natural frequencies by considering the system, in turn, to be pivoted about the nodal points. [16]

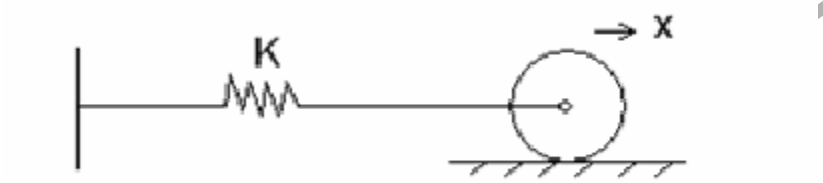
4. Write a note on the following:
   a) Road roughness and its effect on the automobile.
   b) Balancing of the engine. [8+8]

5. Explain the following with neat diagrams:
   a) Forces acting on tyres of a car.
   b) Tyre-road inter action. [8+8]

6. a) Explain Dunkerley's equation by considering suitable system.
   b) Using matrix iteration, find the natural frequency of the system as shown in following figure. (equal masses equally spaced on strings). [16]



7. a) A circular cylinder of mass 2kg and radius 8cm is connected by a spring of stiffness 2000 N/m as shown in figure below. It is free to roll on horizontal rough surface without slipping, determine the natural frequency.



   b) A spring mass system has a period 0.2sec what will be the new period if the spring constant is increased by 45%. [8+8]

8. The disc of a torsional pendulum has a moment of inertia of 800 kg cm^2 and is immersed in a viscous fluid. The brass shaft attached to it is of 12 cm diameter and 40 cm long. When the pendulum is vibrating, the observed amplitudes on the same side of the rest position for successive cycles are 10^0, 8^0 and 6^0. Determine:
   a) Logarithmic decrement
   b) Damping torque at unit velocity, and
   c) The periodic time of vibration. Take G = 4.4 x 10^{10} N/m^2. [16]

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Code.No: R05412402 | R05 | SET-3

IV B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010
VEHICLE DYNAMICS
(AUTOMOBILE ENGINEERING)

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

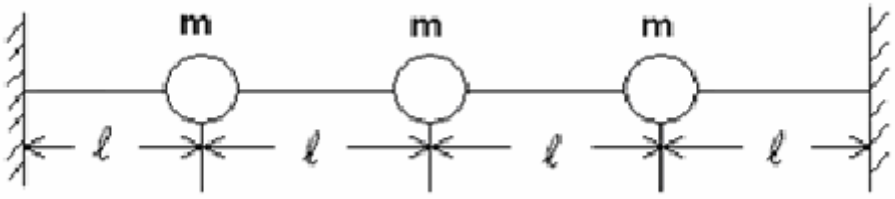
Answer any FIVE questions
All questions carry equal marks
- - -

1. An automobile of mass 2500 Kg has a wheel base of 3.2 meters. Its center of gravity is located 1.5 meters behind the front wheel axis and has a radius of gyration about its center of gravity as 1.1 meter. The front springs have a combined stiffness of 5.88×10^6 N/m and rear springs 6.37×10^6 N/m. Find the principal modes of vibration of the automobile, and locate the nodal points for each mode. Check the two natural frequencies by considering the system, in turn, to be pivoted about the nodal points. [16]

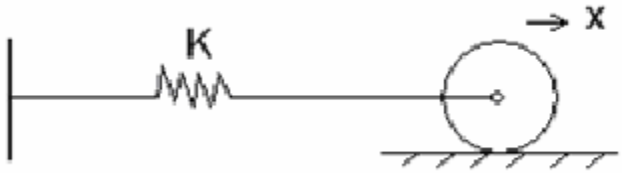
2. Write a note on the following:
   a) Road roughness and its effect on the automobile.
   b) Balancing of the engine. [8+8]

3. Explain the following with neat diagrams:
   a) Forces acting on tyres of a car.
   b) Tyre-road inter action. [8+8]

4. a) Explain Dunkerley's equation by considering suitable system.
   b) Using matrix iteration, find the natural frequency of the system as shown in following figure. (equal masses equally spaced on strings). [16]



5. a) A circular cylinder of mass 2kg and radius 8cm is connected by a spring of stiffness 2000 N/m as shown in figure below. It is free to roll on horizontal rough surface without slipping, determine the natural frequency.



b) A spring mass system has a period 0.2sec what will be the new period if the spring constant is increased by 45%. [8+8]

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Code.No: R05412402 | R05 | SET-4

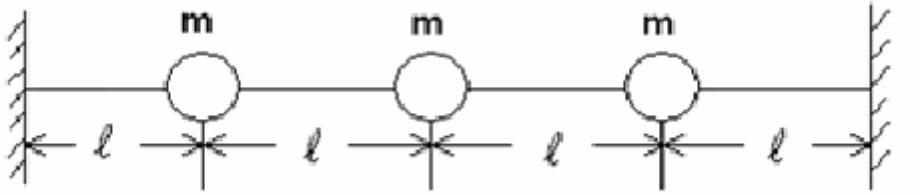
IV B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010
VEHICLE DYNAMICS
(AUTOMOBILE ENGINEERING)

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

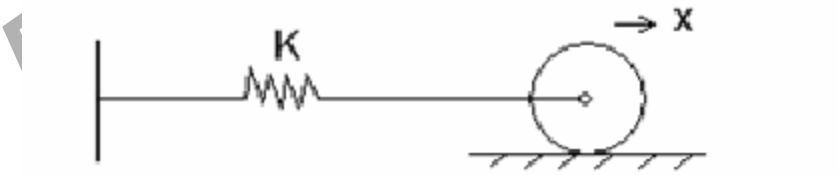
Answer any FIVE questions
All questions carry equal marks
- - -

1. Explain the following with neat diagrams:
   a) Forces acting on tyres of a car.
   b) Tyre-road inter action. [8+8]

2. a) Explain Dunkerley's equation by considering suitable system.
   b) Using matrix iteration, find the natural frequency of the system as shown in following figure. (equal masses equally spaced on strings). [16]



3. a) A circular cylinder of mass 2kg and radius 8cm is connected by a spring of stiffness 2000 N/m as shown in figure below. It is free to roll on horizontal rough surface without slipping, determine the natural frequency.



   b) A spring mass system has a period 0.2sec what will be the new period if the spring constant is increased by 45%. [8+8]

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8. Write a note on the following:
   a) Road roughness and its effect on the automobile.
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