Code No: **R41242** **R10** **Set No. 1**

IV B.Tech I Semester Supplementary Examinations, February/March - 2018

VEHICLE DYNAMICS

(Automobile Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks
*****

1 a) Identify and define at least 10 vibration terms with respect to their specifications? [5]

b) Analysis of the oscilloscopic record of a rap test on a machine mounted on isolators reveal that the rate of decay of the amplitude is 2.5% per cycle when the amplitude is 1.5 cm and 4 % when the amplitude is 0.4 cm. Assume both coulomb as well as the viscous damping are present in the system. Determine the magnitude of the damping ratios. [10]

2 a) Write a short note on logarithmic decrement. [5]

b) A mass of 50kg slides back and forth on a dry surface due to the action of a linear spring having stiffness of 20N/mm. After 5 complete cycles the amplitude has been found to be 120mm. Determine.
i) The average coefficient of friction between the mass and the surface if the original amplitude was 170mm.
ii) The time elapsed during five cycles. [10]

3 a) Spherical body of radius ‘r’ rolls without slipping on a concave spherical surface of radius of R. Find the frequency of small vibrations of the sphere about the equilibrium position as shown in figure 3 (a).

Figure 3 (a) [8]

b) What is damping, explain the importance of the critical damping and find the expression for the logarithmic decrement. [7]

4 a) How is the critical speed of a shaft determined? Discuss about various vibration tests with examples. [7]

Code No: **R41242** **R10** **Set No. 1**

b) A vibrating system having mass 2 kg is suspended by a spring of stiffness 2000 N/m and it is put to harmonic excitation of 20 N. Assume viscous damping. Determine
(i) The resonant frequency
(ii) The phase angle at resonance
(iii) The amplitude at resonance
(iv) The frequency corresponding to the peak amplitude
(v) Damped frequency. [8]

5 a) Describe the basic phenomenon of coordinate coupling. [5]
b) Find the natural frequency and amplitude ratio (mode shape) of the system as shown in figure 5 (b) below.

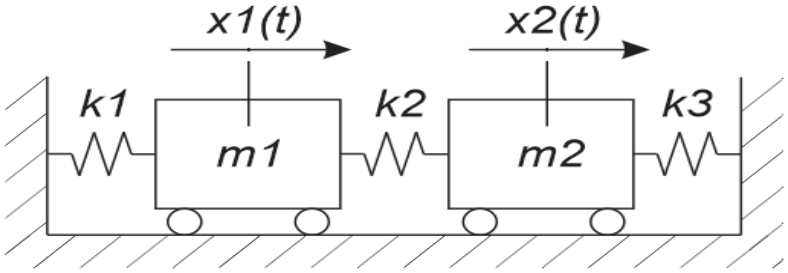

Figure 5 (b) [10]

6 Using D'Alembert's principle derive the differential equation of vehicle vibration with single degree of freedom for free vibration and obtain the solution and discuss
the following cases
(i) Over damping
(ii) Critical damping. [15]

7 a) Briefly explain about tyre construction and physics of tyre traction on dry and wet surface. [8]
b) Explain SAE recommended terminology of type road interaction. [7]

8 a) Explain the orthogonality principle. [5]
b) Using the Holzer's method, how do you find the intermediate natural frequencies of the tensional system shown in figure 8 (b) below?

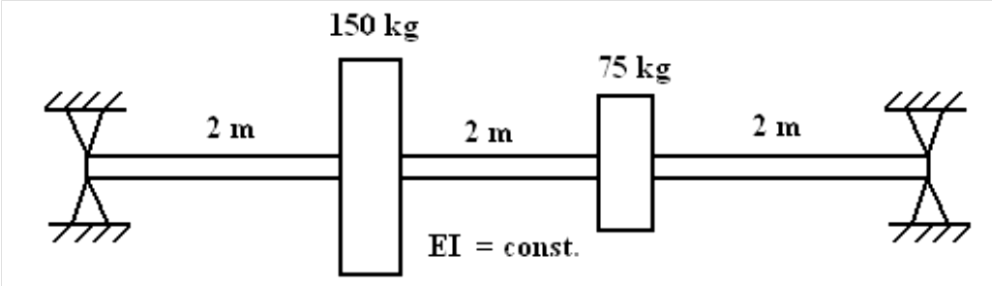

Figure 8 (b) [10]