Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(AE) (2011 Onwards) (Sem.–6)

VEHICLE DYNAMICS

Subject Code : BTAE-603

Paper ID : [A2382]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**
4. **Assume any missing data suitably.**

SECTION-A

1. Write briefly :

a) What is meant by magnification factor?

b) Define transmissibility.

c) Is there any difference between Eigen value and natural frequency? Explain.

d) What is meant by wheel whop?

e) What is meant by rigid mode of vibration?

f) What is modal analysis?

g) What are various cornering forces?

h) What is meant by characteristic speed?

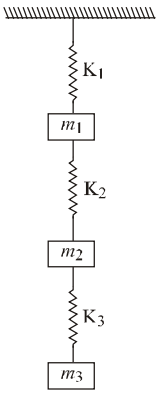
i) What is meant by roll center?

j) What is meant by a banked road?

SECTION-B

2. Compare free and forced vibrations based upon inputs and outputs of the vibrating system.

3. Estimate the fundamental frequency of vibration of a system shown in figure below. Assume that $m_1 = m_2 = m_3 = m$; $k_1 = k_2 = k_3 = k$ and the mode shape is $X = \begin{Bmatrix} 1 \\ 2 \\ 3 \end{Bmatrix}$.



4. Explain the factors influencing the choice of suspension spring rate.

5. Describe the ride characteristics of tyre.

6. Differentiate between low speed turning and high speed turning.

SECTION-C

7. Calculate the pitch and bounce centers and their frequencies for a car with following characteristics :

   Front ride rate =127 lb/in

   Front tire load = 957 lb

   Rear ride rate = 92.3 lb/in

   Rear tire load = 730 lb

   Wheelbase = 100.6 in

   Dynamic Index =1.1

8. Determine the eigen values and eigenvectors of a vibrating system given by

$$m = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix} \text{ and } k = \begin{bmatrix} 1 & -2 & 1 \\ -2 & 4 & -2 \\ 1 & -2 & 1 \end{bmatrix}$$

9. Write a detailed note on stability of a vehicle on a slope and on a curve.