Paper / Subject Code: 52202 / Vehicle Dynamics

[Time: 3 Hours]   [Marks:80]

Please check whether you have got the right question paper.

N.B:
1. Draw neat sketches whenever necessary.
2. **Q. No. 1** is compulsory.
3. Solve any **three** questions from the remaining four questions.
4. Assume suitable data wherever necessary.

Q.1   Answer **any four** of the following :   20

   a) Explain Friction Circle.
   b) What are the mechanisms which generated lateral forces at tyre road contact patch during cornering? Explain in short any one.
   c) Enlist functions of active suspension and explain any two.
   d) The natural frequency of front suspension is kept low than rear suspension. Why?
   e) Write a note on anti roll bar.
   f) Write a note on steering geometry angles.

Q.2   a)   Explain how aerodynamic drag is created?   10

      b)   Derive equation to find out pair of double conjugate points. How it is applied to real vehicle?   10

Q.3   a)   A lateral force of 300 N acting on the vehicle at its CG. What should be the steering angle of the front wheel to cancel the effect of lateral force on the vehicle in motion.   10
Mass of the vehicle = 2500 kg, wheel base = 3 m,
Distance of CG from front axle = 1.75 m, speed = 50 KmPh
CF = - 80000 N/rad, CR = - 84000 N/rad

      b)   Explain interconnected suspension with diagram. Why it is used in automobiles and how it is achieved?   10

Q.4   a)   Find the position of double conjugate points and pitch and bounce frequencies of a passenger car from following data: 10
         1) Sprung mass – 1450 kg
         2) Radius of gyration – 1.22 m
         3) Wheel base – 3.05 m
         4) Front suspension spring rate – 33 KN/m
         5) Rear suspension spring rate – 35.75 KN/m
Position of CG from front axle – 1.37 m.

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b) Explain conicity and ply steer. How it affects vehicle performance?   **10**

Q.5 a) What is roll center? Locate roll centers for any four types of suspension systems.   **10**

b) Derive an equation for steady state response to yawing moment. Explain the importance of stability derivatives.   **10**

Q.6 Write short note on **(Any Four)**   **20**

     a) Jack knifing of an Articulated vehicle
     b) Tyre vibrations
     c) Vehicle stability control
     d) Antirollover braking
     e) Wheel wobble and wheel shimmy

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