BE/Sem VIII/CBSGS/AUTO/MJ2019/14-05-2019

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) Derive an equation for basic stability derivatives..
b) Explain special properties of double conjugate points.
c) Explain Maurice Olley's criteria for suspension frequency.
d) Explain the terms : Jounce, rebound, body roll, roll steer and power squat
e) What do you mean by Anti pitch or anti squat geometry ? Explain.
f) What is Cornering stiffness and how it is related to vehicle performance?

Q.2 **a)** Explain the effect of wheel alignment angle on stability and comfort of vehicle. **10**

b) Explain passive, semi active and active suspension. **10**

Q.3 **a)** Explain wheel wobble and wheel shimmy. **08**

b) Find the position of double conjugate points and pitch and bounce frequencies of a passenger car from following data: **12**
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
6) Position of CG from front axle – 1.37 m.

Q.4 **a)** Prove that, C12 = C21 for equalizing type suspension. **10**

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

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Q.5 a) Write a note on aerodynamic forces and moments. **10**

b) Find the curvature response per degree of steering angle at 60 kpH. The data given as : **10**
Mass of the vehicle – 1200 Kg
Wheel base – 2.4 m
Position of CG from front axle – 1.25 m
Cornering stiffness of front tyres – 60 KN/rad
Cornering stiffness of rear tyres – 65 KN/rad

Q.6 Write short note on (**Any four**) : **20**
i) Variable Rate coil spring
ii) Interconnected suspension
iii) Jack knifing of articulated vehicles
iv) Camber thrust and its relevance to vehicle performance
v) Influence of front wheel drive on steering

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