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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Sixth Semester, B.E. - Automobile Engineering

Semester End Examination; June - 2016

Automotive Chassis and Suspension

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each Unit.*
ii) Assume suitable missing data if any.
iii) Use of Design Data hand book is permitted.
iv) Draw neat pencil sketches only.

UNIT - I

1 a. With sketches, explain the Chassis layout with reference to front and Rear wheel drive. 10

b. A motor car with wheel base 2.75 m with a centre of gravity 0.85 m above the ground and 1.15 m behind the front axle has a coefficient of adhesion 0.6 between the tyre and ground. Calculate the maximum acceleration when vehicle is 10

(i) Driven on four wheels (ii) Driven on front wheels only (iii) Driven on rear wheels only

2 a. Explain the different types of Chassis frames with neat sketches. 10

b. With neat sketches, explain different frame section, and materials, used in chassis construction. 10

UNIT - II

3 a. Explain the different types of stub axles with sketches. 8

b. Define the following geometrics related to front wheel of an automobile with sketches.

i) Camber ii) Caster iii) Steering Axis Inclination 12

iv) Toe-in and Toe-out v) Combined angle vi) Scrub radius

4 a. Sketch and explain the working principle of hydraulic power steering systems, highlighting the function of important components. 10

b. What is the function of a steering system? Highlight the important requirements of a good steering system. 5

c. Differentiate between under steer and oversteer with sketches 5

UNIT - III

5 a. Explain the construction and function of universal Joint with sketches. 8

b. Two shafts, the axes of which intersect but are inclined at 20º to each other are connected by a Hooke's joint. If the driving shaft has a uniform speed for 1000 rpm, find from first principles, the variation in the speed of the driven shaft. The driven shaft carries a rotating mass which weighs 147 N and has a radius of gyration of 0.25 m. Find the accelerating torque on the driven shaft for the position when the driven shaft has turned 45º from the position in which its fork end is in the plane containing the two shafts. 12

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6	a.	Explain the different types of live axles (rear axle) with sketches.	10
	b.	With a neat sketch, explain the working principles of differential assembly.	10

UNIT - IV

7	a.	Sketch a drum brake showing its important components and their function.	10
	b.	What are the merits and demerits of disc brakes over drum brakes?	10
8	a.	With sketches, explain the working principles of the following brake components. (i) Master cylinder (ii) Wheel cylinder	10
	b.	A passenger car with all wheel brakes weighting 13342 N makes an emergency stop at 96 kmph. The rolling resistance and air resistance at 96 kmph is 804 N total. The coefficient of adhesion is 0.5. Calculate; (i) the retarding force if the brakes are applied to locking point (ii) Heat flow per minute.	10

UNIT - V

9	a.	What are the functions and requirements of suspension systems?	8
	b.	A vehicle spring of semi elliptic type has leaves of 75 mm width and 10mm thickness and a effective length 900 mm. If the stress is not to exceed 220725 kPa when the spring is loaded to 4905 N. Estimate the required number of leaves and the deflection under this condition. If the spring is just flat under load; what is the initial radius. Take; $E = 196.2 \times 10^6$ kPa	8
	c.	Sketch typical Macpherson strut and label important components.	4
10	a.	With a neat sketch, explain the construction of an automotive wheel disc.	7
	b.	Explain the construction of a tyre with a sketch.	8
	c.	Enumerate the merits of a tubeless tyre over tubed tyre.	5

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