

# College of Engineering, Pune

(An Autonomous Institute of Government of Maharashtra, Pune- 411 005)

## End Semester Examination ME 410- Automobile Engineering

**Programme:** B. Tech.

**Academic Year:** 2012-2013

**Duration:** 3 hrs

**Date:** 1/12/2012

**Specialization:** Mechanical Engineering

**Semester:** I

**Max. Marks:** 50

### Instructions:

1. Attempt any **FOUR** questions.
2. Figure to right indicate full marks.
3. Make necessary assumptions and assume suitable data wherever required.
4. Use of non-programmable calculators, steam tables and gas tables are allowed

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	<b>Marks</b>
<b>Q1.</b> a) Classify automotive batteries from different viewpoints and compare their performance.	<b>4</b>
b) A car weighing 2175 kg has a static weight distribution of 50:50 on the axles. The wheel base is 3 m and the height of centre of gravity above ground is 0.55 m. If the coefficient of friction on the highway is 0.6, calculate the advantage of having rear wheel drive rather than the front wheel drive as far as gradeability is concerned. The engine power is not a concern.	<b>3</b>
c) State in what type of suspension and for which axle are the torsion bars and stabilizer arms used? Explain as to how the variation of wheel track during springing of the wheels is reduced to minimum?	<b>3</b>
d) What are the requirements of a wheel? Enumerate the advantages and disadvantages of cast wheel over non-casted wheel	<b>3</b>
<b>Q2.</b> a) Write short note the following: i) Power windows, ii) Odometer, iii) Speedometer and iv) Different types of sensors	<b>4</b>
b) What is whirling of a propeller shaft? Discuss the parameters on which whirling of propeller shaft depends	<b>3</b>
c) Explain the common faults encountered in gearboxes, their causes and suggest remedies. What can be the probable causes for i) hard shifting of gears, ii) slipping of gears out of arrangement, and iii) noise in neutral position?	<b>6</b>
<b>Q3.</b> a) What do you mean by 'Centre point steering' and wheel alignment? What purposes are served by toe-in & toe-out, camber & caster, kingpin inclination & steering axis inclination, and included angle & scrub radius. How is the stability of the vehicle affected by their improperness?	<b>4</b>
b) Classify tools and equipments in different categories, which are suitable to the requirements of an auto garage having a well-equipped workshop also.	<b>4</b>
c) Explain the effects of various factors on the performance of a tyre. In this respect, justify the importance of tyre rotation.	<b>4</b>

- Q. 4 a) Why maintenance of an automobile is necessary? What are different kinds of maintenance of a car? 4
- b) What are the requirements of a good clutch facing? List various facing materials and narrate their merits and demerits. How are they bonded? 4
- c) An ice sports car has a laden weight of 1551 kg and wheelbase of 2.788 m. Its C.G. is 1.31 m in front of the rear axle and 700 mm above the level road. The Coefficient of road-wheel adhesion is 0.55. If the car is moving upward on an incline of  $15^\circ$  with the horizontal at a speed of 120 kmph, then calculate the loads on front and rear wheel axles, acceleration, and stopping distance when i) only the front brakes are applied, ii) only the rear brakes are applied, and iii) all the four brakes are applied 4
- Q. 5 a) Explain the mechanisms of working of cooling water temperature gauge, and lubricating oil pressure gauge. 4
- b) A 'bus' having frontal projected area of  $1.5 \times 1.5$  m travels at 50 kmph. If weight density of air is  $11.5 \text{ N/m}^3$ , coefficients of lift and drag are 0.75 and 0.15 respectively; calculate i) total lift force, ii) total drag force, iii) resultant force, and iv) power required to keep the 'bus' moving. 4
- c) What are the objectives of employing a suspension system on an automobile? What purposes are served by the springs and the shock absorber in it? 4