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College of Engineering, Pune

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

End Semester Examination
ME 410- Automobile Engineering

Programme: B. Tech. **Specialization:** Mechanical Engineering
Academic Year: 2013-2014 **Semester:** I
Duration: 3 hrs **Max. Marks:** 60

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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			Marks
Q1.	**a)**	Classify tools and equipments in different categories which are suitable to the requirements of an auto garage having a well equipped workshop also.	7
	b)	A 4-tonner truck having effective frontal cross-sectional area 2.4 m^2 is to be propelled at 60 kmph on a grade of 10%. The rolling resistance is 20 kg/tonne of the vehicle, and aerodynamic coefficient is 0.0035. Determine i) the required engine power if the transmission efficiency is 93%. If an engine of 130 Bhp is installed on it, what will be ii) the draw horsepower at 60 kmph and 30 kmph, and iii) pull at 30 kmph.	3
	c)	Explain the meaning of 'ignition advance'. Which factors affect its variation? What are the normal values of ignition advance on motorcycles, cars and racing cars?	5
Q2.	**a)**	Differentiate between the following: i) Periodic maintenance and break-down maintenance, ii) Servicing and repairing and iii) Trouble shooting and trouble diagnosing.	5
	b)	What is the need of using a differential assembly? Discuss different types of differentials? Sketch and explain the construction and working of differentials for i) small automobile and ii) big auto-vehicles	5
	c)	Define the following terms, differentiate between them and state their significance in respect of vehicles stability and riding comfort. i) Pitching and rolling, ii) Bouncing and Yawing, iii) Sprung and Un-sprung weights, and iv) soft and hard spring.	5
Q3.	**a)**	What are the requirements of a good clutch facing? List various facing materials and narrate their merits and demerits. How are they bonded?	5
	b)	Classify shock absorbers from various view points. Explain the working principle of a hydraulic shock absorber. What are the novelties in gas filled type and electro-rheological type shock absorber?	5
	c)	Classify automotive batteries from different viewpoints and compare their performance.	5

Q. 4 **a)** 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? **5**

b) Discuss various troubles encountered with the wheels and tyres. What are their symptoms and probable causes? Suggest possible remedies also. **5**

c) State the principle and derive equation for correct steering of a vehicle. Hence draw Ackerman's steering mechanism, and explain wheel lock and steering lock angles. **5**

Q. 5 **a)** Explain the mechanisms of working of cooling water temperature gauge, and lubricating oil pressure gauge. **5**

b) A truck of GVW 48 kN is to travel on an upward road grade of 17% at 45 kmph in second gear. Its frontal cross-sectional area is 5.1 m^2 and effective radius of the wheels is 420 mm. If transmission efficiency in second gear is 83%, coefficient of rolling resistance are 0.017 and 0.044 respectively, then calculate i) minimum power required in the engine at 2500 rpm. ii) the gear ratio in second gear. iii) maximum speed of the vehicle in the top gear on level road at the same engine speed, and iv) gear ratio in top gear. The reduction ratio at final drive (differential) is 4.2 and transmission efficiency in top gear is 92%. Neglect road friction resistance. **5**

c) Explain the working of an electric brake with the help of a suitable diagram. Discuss its advantages and limitation. Also discuss the engine gas operated brake: construction and working. **5**