

**CS/B.Tech/(ME/PE)/SEM-8/ME-811/2013**

**2013**

**AUTOMOTIVE ENGINEERING**

*Time Allotted : 3 Hours*

*Full Marks : 70*

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words*

*as far as practicable.*

**GROUP – A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any *ten* of the following :

$10 \times 1 = 10$

i) In an automobile engine the temperature of the piston

will be more at

a) the crown of the piston

b) the skirt of the piston

c) the piston pin

d) the piston walls.

ii) As the no. of cylinders on the multicylinder engine

increases, the power to weight ratio

a) remains the same b) decreases

c) increases d) becomes zero.

iii) The starter motor is driven by

a) chain drive b) gear drive

c) flat belt drive d) V-belt drive.

iv) When a vehicle turns at a corner, the action of the

differential causes

a) the inner wheel to speed up

b) the outer wheel to speed up

c) an increase in the torque applied to inner wheel

d) an increase in the torque applied to the outer

wheel.

v) The frame may get distorted to a parallelogram shape

due to

- a) weight of the vehicle
- b) weight of the passenger
- c) cornering force
- d) wheel impact with the road obstacles.

vi) The purpose of transmission in an automobile is

- a) to vary the speed
- b) to vary the torque at the road wheels
- c) to vary the power of automobiles
- d) none of these.

vii) The purpose of the brake is to

- a) store energy
- b) change friction into heat
- c) convert potential energy into kinetic energy
- d) convert kinetic energy into heat energy.

viii) The dynamo in automobile

- a) convert mechanical energy into electrical energy
- b) continuously recharge the battery
- c) acts as reservoir of electrical energy
- d) supplies electric power.

ix) The purpose of adding antifreeze solution to the coolant

is to

- a) prevent the coolant from freezing
- b) lower the freezing point of the coolant
- c) stop the formation of ice in the radiator
- d) avoid piston seizure due to ice in the water.

x) The material of the connecting rod is

- a) mild steel b) forged steel
- c) tool steel d) cast iron.

xi) For a four cylinder engine operating at  $N$  rpm, the contact breaker must make and break the circuit

- a)  $N$  times b)  $2N$  times  
c)  $N/2$  times d) none of these.

xii) Indicated power is directly proportional to

- a) Torque b) air consumption  
c) cylinder peak pressure d) none of these.

### **GROUP – B**

#### **( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. What are the functions of the frame ? State why the frames narrower at the front and why it is upswept at the front and rear. Give the layout of the components of the transmission system in 4-wheel rear drive vehicle.
3. What is the function of the propeller shaft ? Why is slip joint used in propeller shaft ? Describe Hooke's joint with a neat sketch.
4. What do you mean by piston clearance ? Why is it necessary ? What is piston slap ? Why does it occur and how is it eliminated ?
5. What is CNG ? Write the advantages and disadvantages of using CNG in automobiles.
6. What is the importance of lubrication in an automobile engine ? What are the different lubricating systems used in an automobile engine ? What do you understand by 'crankcase ventilation' ?
7. With a neat sketch discuss how the power flows through a 3-speed gear box when the first gear and intermediate gears are engaged.

### **GROUP – C**

#### **( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

8. An eight cylinder, four stroke engine of 9 cm bore and 8 cm stroke with compression ratio of 7 is tested at 4500 r.p.m. on a dynamometer which has 54 cm arm. During a 10 minute test the dynamometer scale reading was 42 kg and the engine consumed 4.4 kg of gasoline having a calorific value of 44,000 kJ/kg. Air 27°C and 1 bar was supplied to the carburetor at the rate of 6 kg/min. Find the following :

- (i) The brake power developed
- (ii) The brake mean effective pressure
- (iii) The brake specific fuel consumption
- (iv) The brake specific air consumption
- (v) The brake thermal efficiency
- (vi) Volumetric efficiency
- (vii) The air-fuel ratio.

9. A vehicle has wheel base of 2.5 m and weight 13.5 kN. The c.g. of the car is 1.15 m in front of the rear axle and 0.8 m above the ground level. The vehicle has brakes on all the four wheels. If the vehicle is moving up an inclination such that  $\sin \theta = 0.1$  and  $\mu = 0.5$ , determine :

- a) the load distribution between front and rear axle.
- b) the distance at which it can be stopped while moving at a speed of 48 km/h, when only rear wheel brakes applied.

10. a) Explain the principle of Ackermann steering gear with diagram.

b) A motor car has a wheel base of 2.743 m and pivot centre of 1.064 m. The front and rear wheel track is 1.217 m. Calculate the correct angle of outside lock and turning circle radius of the outer front and inner rear wheels when the angle of inside lock is 40°.

11. a) What is the difference between D.C. generator and an alternator ? Explain the construction and working of alternator.

b) Why is the starter motor used in automobile engine ? State the function of cut-out relay. Explain the construction of cut-out relay.

12. a) "Torque converter is a gear box." Justify the statement. Describe the construction and working of a torque converter with a neat sketch.

b) Describe battery ignition system with a diagram. What are the differences between battery ignition and magneto ignition system ? 8 + 7

13. a) Describe constructional details of piston. What is the material of piston ?

b) What are the cylinder liners ? Why is this used in cylinders ? What are the types of cylinder liner ? Describe any one of the liners.

c) What are the purposes of crank case and oil pan in engine cylinder ? 5 + 7 + 3

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