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Paper Code : ME-803D

AUTOMOBILE 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 the following : $10 \times 1 = 10$

i) In a four-stroke SI engine the exhaust valve usually opens

a) at BDC

b) at TDC

c) 35° to 60° before BDC

d) 35° to 60° after BDC

ii) Injector is not located in

a) cylinder b) port

c) manifold d) crankcase.

iii) An engine has a clearance volume 100 cm^3 and swept volume of 800 cm^3. The compression ratio is

a) 7 : 1 b) 8 : 1

c) 9 : 1 d) 10 : 1.

iv) Normally the clutch is mounted between the

a) engine and gear box

b) gear box and propeller shaft

c) propeller shaft and final drive

d) final drive and differential.

v) The reason why a laminated spring is made up of a series of leaves is to

a) reduce interleaf friction

b) soften the spring action and increase the maximum deflection

c) allow the leaves to slide during the bump movement

d) overcome the weakness at the centre of a single leaf spring.

vi) The type of rear axle is used in heavy commercial vehicle is

a) quarter floating

b) semi-floating

c) three quarter floating

d) full floating.

vii) Ignition coil is used to

a) step up current b) step down current

c) step up voltage d) step down voltage.

viii) The function of universal joint is to allow the propeller shaft to

a) change length

b) bend sideways

c) transfer torque at an angle

d) change of inclination.

ix) The motion of the cam is transferred to the valves through

a) pistons b) rocker arms

c) camshaft pulley d) valve stems.

x) The firing order for an in-line four cylinder I.C. engine is

a) 1-2-3-4 b) 1-3-4-2

c) 1-2-4-3 d) 1-3-2-4.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Deduce the equation of friction torque for single plate clutch using uniform wear theory.

3. Sketch and explain the working of torque converter.

4. Explain semi-floating type rear axle with neat sketch.

5. Why are two compression rings used in piston ? What is piston slap ? Why does it occure ?

6. Why is slip joint used in propeller shaft ? Describe Hoock's joint with a neat sketch.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) What is carburetion ? Explain the working principle of carburetor ? 5

b) With suitable sketch explain the MPFI system ? 6

c) What are the main objects of fuel pump and fuel injector for diesel engine ? 4

8. a) Explain the working principles of Hydraulic braking system with simple sketches. 6

b) What are the functions of suspension system ? 3

c) Calculate the power required in an engine fitted on a tuck whose weight is 25 kN, frontal cross-sectional area is 3·25 m^2 and which can run on level road at a highest speed of 80 krn/hr. The mechanical efficiency of the vehicle is 80% and transmission efficiency of the vehicle is 90%. Take coefficient of rolling resistance K_r = 0·02 and aerodynamic coefficient $K_a = 0 \cdot 035$ N-hr^2/m^2km^2.

6

9. a) What are the various resistances to motion of a vehicle ? How do they affect power for propulsion ? Define tractive effort. Establish a relation between engine power and tractive effort. 7

b) A car weights 13 kN and has a wheelbase of 2·5 m. The centre of gravity of the car is 1·2 m in front of the rear axle and 800 mm above the ground level. The car is having brakes on rear wheels. The coefficient of friction between the road and the wheels is 0·5. If the car is moving up an inclined of angle whose sine is equal is 0·1.

Calculate :

(i) load distribution between front and rear axles.

(ii) distance at which it can be stopped while going at a speed of 50 km/h when only rear wheel brakes are used. 8

10. a) What is the importance of lubrication is automobile engine ? Discuss any three types of lubricating system used in automobile engine. What do you understand by crankcase ventilation ? 9

b) Describe the construction and working of a telescopic shock absorber with sketch. 6

11. a) What are the different types of gear box ? With the help of neat diagram explain the construction and working of sliding mesh gear box. 7

b) A multi-disc clutch has 3 discs on the driving shaft and 2 on the driven shaft. The outside diameter of the contact surfaces is 240 mm and the inside diameter is 120 mm. Assuming uniform wear and coefficient of friction as 0·25; calculate the maximum axial intensity of pressure between the discs for transmitting 24 kW at 1575 rpm. 5

c) Briefly explain the construction of connecting rod. 3