MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : AUE-704B

MODERN VEHICLE TECHNOLOGY

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) Multi-point fuel injection system uses
   a) manifold injection
   b) direct injection
   c) port injection and throttle body injection
   d) none of these.

ii) A traction control system (TCS) in automobiles controls the
   a) engine power during acceleration
   b) vibrations on the steering wheel
   c) torque that is transmitted by the tyres to the road surface
   d) stopping distance in case of emergency.

iii) The function of antilock brake system (ABS) is that it
   a) reduces the stopping distance
   b) maintains directional control during braking by preventing the wheels from locking
   c) minimizes the brake fade
   d) prevents nose dives during braking and thereby postpones locking of the wheels.

iv) With EFI of diesel engines
   a) sharp start and stop is not possible
   b) very high injection pressure can be obtained
   c) sudden cylinder cut-off is impossible
   d) diagnostic properties are poor.

v) Knock sensor is mounted in the
   a) cylinder block b) catalytic connector
   c) gear box d) None of these.

vi) The brake pedal during ABS operation
   a) is pushed upward forcefully
   b) pedal stroke becomes longer
   c) transmits slight kichback to the driver's foot
   d) all of these.

vii) The cold start injector

a) maintains stoichiometric air-fuel ratio

b) provides lean air-fuel ratio

c) gives rich air-fuel ratio

d) none of these.

viii) Energy density of hydrogen fuel as liquid is

a) double that of petrol

b) half that of petrol

c) one fourth that of petrol

d) almost same that of petrol

ix) Toyota Hybrid Vehicle

I. provides reduced CO_2 emissions

II. is equipped with Petrol Engine and Diesel Engine

III. uses a Power Split Device with a Planetary Gear in their transmission

IV. works on Sterling Heat Cycle.

of these

a) I and III b) II and III

c) I and IV d) I, III and IV.

x) Small and Tiny Efficient Engine is used in

I. Toyota Prius

II. Honda Insight

III. Hyundai Accent

IV. REVA

of these

a) I b) II

c) I and III d) IV.

GROUP – B

(Short Answer Type Questions)

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

2. Describe the electronic control pneumatic (air) suspension for on and off road use.

3. What are the differences between DTSI, DTS-Si, and DTS-Fi systems in two wheeler technology ?

4. What is the difference between conventional diesel injection and common rail injection system ?

5. What is Pilot Injection ? Why is it used ? 3 + 2

6. What is unit injector ? How does the Electronic Unit Injector work ? 2 + 3

7. What is Electronic Ignition ? How does it work ? 2 + 3

GROUP – C

(Long Answer Type Questions)

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

8. a) What is a Hybrid Vehicle ? Write down the needs of Hybrid Vehicle and name various Indian models operating now.

   b) Explain with sketch various methods of combining IC Engine with Electric Motor to drive a passenger vehicle. 6 + 9

9. A car weighs 813 kg. and its engine develops 20 HP at 2500 r.p.m. At this engine speed, the road speed of the car on the top gear is 64·37 kmph. Bottom gear ratio is 3·5 : 1 and the efficiencies of transmission are 88% and 80% on top and bottom gears respectively. The diameter of tyres is 0·762 m and the projected area of the vehicle is 1·116 m^2. The co-efficient of air resistance is 0·0032 and road resistance is 0·023.

   Calculates the following :

   a) Speed of the car in Bottom Gear

   b) Tractive Effort available of the wheels on Top and Bottom

   c) Gradient which it can climb on the Bottom Gear

   d) The Tractive Effort of Wheels required to start the car on load and attain a speed of 48·28 kmph in 10 secs. 2 + 4 + 4 + 5

10. a) State the working principles of regenerative braking.

    b) Explain the regenerative braking system in hybrid and electric vehicle with neat sketch.

    c) What are the advantages of regenerative braking system ? 4 + 8 + 3

11. What is Variable valve timing (VVT) technology ? what are the benefits of this VVT technology ? Explain the construction and working of any type of VVT technology. 3 + 4 + 8

12. a) Discuss the function of a Sensor, Actuator and Control System.

b) Indicate the different types of Sensors used in automobiles and their uses. 6 + 9