BACHELOR OF ENGINEERING (MECHANICAL ENGINEERING)
THIRD YEAR SECOND SEMESTER EXAM 2019

ADVANCED AUTOMOTIVE ENGINES

Time: 3 hours   Full Marks: 100

(Answer question no. 1 any four from the rest)

(Assume data if required)

1. Multiple choice questions: (Answer any ten)

   a) Common rail injection system uses injection pressures of the order of

      (a)   100-200 bar

      (b)   200-400 bar

      (c)   400-600 bar

      (d)   1500 bar

   b) Continuous injection system usually has

      (a)   plunger pump

      (b)   rotary pump

      (c)   gear pump

      (d)   vane pump

   c) ECU is the electronic injection system used for

      (a)   calculating the appropriate injection timing

      (b)   meeting only certain operating conditions

      (c)   closing the injection valve only

      (d)   none of the above

   d) 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

   e) The secondary winding of ignition coil consists of

    (a)   few turns of fine wire

    (b)   few turns of thick wire

    (c)   many turns of fine wire

    (d)   few turns of thick wire

f)   If the contact breaker gap is small, it results in

    (a)   advanced timing

    (b)   increased dwell

    (c)   rapid burning of the pointer gaps

    (d)   none of the above

g) Ignition timing is adjusted by

    (a)   tachometer

    (b)   stroboscopic light

    (c)   stop watch

    (d)   accurate clock

h) Stoichiometric air-fuel ratio of petrol engine is roughly

    (a)   50:1

    (b)   25:1

    (c)   15:1

    (d)   1:1

i)   Venturi in carburetor results in

    (a)   decrease in air velocity

    (b)   increase in air velocity

    (c)   decrease in fuel flow

    (d)   increase in manifold vacuum

j)   The choke is closed when the engine is

    (a)   accelerating

    (b)   hot

    (c)   cold

      (d)   idling

k) A simple carburetor supplies rich mixture during

      (a)   starting

      (b)   idling

      (c)   cruising

      (d)   accelerating

l) The choke in an automobile meant for supplying

      (a)   lean mixture

      (b)   rich mixture

      (c)   stoichiometric mixture

      (d)   weak mixture

$$2 \times 10 = 20$$

2. a) Define carburetion. Explain factors that affect the process of carburetion. By means of a suitable graph explain the necessary carburetor performance to fulfill the engine requirements.

   b) How the efficiency and power of a SI engine vary with air-fuel ratio for different load and speed conditions? Explain why a rich mixture is required for the following: (i) idling, (ii) maximum power and (iii) sudden acceleration.

$$10 + 10 = 20$$

3. a) A simple jet carburetor is required to supply 5 kg of air and 0.5 kg of fuel per minute. The fuel specific gravity is 0.75. The air is initially at 1.0 bar and 300 K. Calculate the throat diameter of the choke for a flow velocity of 100 m/s. Velocity coefficient is 0.8. If the pressure drop across the fuel metering orifice is 0.8 of that of the choke, calculate orifice diameter assuming $C_{df} = 0.60$ and $\gamma = 1.4$.

b) Explain with a neat sketch the main metering system of the carburetor required during cruising and full throttle operations.

12+8=20

4. a) Give a brief account of air pollution due to engines. What are the problems of exhaust emissions?

b) Give an overview of the emission norms in India. Compare between bharat stage and euro norms.

c) How does catalytic converters help in reducing HC, CO and NO_x emissions?

6+6+8=20

5. a) What is the necessity and requirements of gasoline injection? Explain with suitable sketch.

b) Mention the various types of gasoline injection systems.

c) Describe the operation of cold start injector in MPFI system.

8+6+6=20

6. a) What is meant by ignition? What is the interrelation between ignition and combustion?

b) What are the requirements of an ignition system?

c) Sketch and describe a typical battery ignition system.

8+4+8=20

7. a) Enumerate various components of a electronic injection system and mention their functions.

b) Sketch and describe transistorized coil ignition (TCI) system.

10+10=20