01941

DIPLOMA IN MECHANICAL ENGINEERING
(DMEVI)

Term-End Examination

December, 2012

BIMEE-031 : I.C. ENGINES

Time : 3 hours   *Maximum Marks : 70*

*Note :   Attempt **any seven** questions. All questions carry **equal** marks.   Use of scientific calculator is **permitted**.*

1.   (a)   Explain with neat sketches the construction   **5+5** and working of the following :
           (i)   Fuel pump   (ii)   Injector
     (b)   The efficiency of an otto cycle is 60% and $\gamma = 1.5$. What is the compression ratio ?

2.   (a)   Discuss the difference between ideal and   **5+5** actual valve timing diagrams of a 4s petrol engine.
     (b)   An engine 200 mm bore and 300 mm stroke works on otto cycle. The clearance volume is $0.0016 m^3$. The initial pressure and tempreture are 1 bar and 60°C. If the maximum pressure is limited to 24 bar, find :
           (i)   The air-standard efficiency of the cycle.
           (ii) The mean effective pressure for the cycle.
                 Assume ideal conditions.

3. (a) Compare the relative advantages and 5+5
disadvantages of four stroke and two stroke
cycle engine.

   (b) An engine working on otto cycle has a
volume of 0.45 m^3, pressure 1 bar and
temperature 30°C at the beginning of
compression stroke. At the end of
compression stroke, the pressure is 11 bar,
210 kJ of heat is added at constant volume.
Determine :

      (i) Pressure, temperature, and volume at
salient points of the cycle.

      (ii) Efficiency.

      (iii) Mean effective pressure.
Assume the cycle is reversible.

4. (a) What do you understand by octane number
of 85 and cetane number 75 ? What is   5+5
H.U.C.R ?

   (b) A single cylinder, 4-stroke cycle diesel engine
with a displacement volume of 7000 cm^3
develops 14.7 kW at 450 rpm with a specific
fuel consumption of 0.272 kg/KWh. The
fuel used is represented by the chemical
formula C_7H_{16}. If 30 percent excess air is
used, determine at inlet conditions of 1.013
bar, and 30°C.

      (i) The air-fuel ratio

      (ii) The volumetric efficiency of the
engine.
For air, take $R_{air} = 0.287$ kJ/kgK.

5. (a) Explain the phenomenon of knocking in S.I. 5+5
engines. What are the different factors which influence the knocking ? Describe the methods used to suppress it.

(b) A simple jet carburettor is required to supply 6 kg of air per minute and 0.45kg of fuel of density 740 kg/m^3. The air is initially at 1.013 bar and 27°C. Calculate the throat diameter of the choke for a flow velocity of 92 m/s. velocity co-efficient = 0.8.

6. (a) What is the reason that two-stroke engine 5+5
is not used in car even though it develops theoretically twice power than that of four-stroke engine ?

(b) A 6-cylinder 4-stroke diesel engine develops 89 kW at 2500 rpm. Its brake specific fuel consumption is 245 g/kWh. Calculate the quantity of fuel to be injected per cycle per cylinder. Specific gravity of the fuel may be taken as 0.84.

7. (a) What do you mean by super charging of IC 5+5
engines ? Explain why super charging is essential for the air craft engines ?

(b) What are the various desired properties of a lubricant ? Explain how additives help to achieve the desired properties ?

8. (a) Explain briefly the various sources from 5+5 which pollutants are emitted from SI engine. Discuss the effects of emission on human health.

    (b) State the advantages and disadvantages of air-cooling system. Name the various types of liquid cooling system.

9. (a) What are the essential requirements to be 5+5 fulfilled by a fuel injection system for C.I engines ? What is the most common injection system used in multi-cylinder diesel engines ?

    (b) The power out put of an I.C. engine is measured by a rope brake dynamometor. The diameter of the brake pulley is 700 mm and the rope diameter is 25 mm. The load on the tight side of the rope is 50 kg mass and spring balance reads 50 N. The engine running at 900 rpm, consumes fuel of calorific value of 44000 kJ/kg, at a rate of 4 kg/h.
    Calculate :
    (i) Brake specific fuel consumption.
    (ii) Brake thermal efficiency.

10. (a) What do you understand by, "ignition 5+5 timing" ? Enumerate the various factors which effect ignition timings.

    (b) Describe in brief the multipoint fuel injection system. Also specify emission control for vehicles.

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