BME-053

DIPLOMA IN MECHANICAL ENGINEERING (DME)

Term-End Examination

December, 2011

BME-053 : APPLIED THERMAL ENGINEERING

Time : 3 hours   *Maximum Marks : 70*

Note : *Answer any seven questions. Assume any missiing data suitably. Use of scientific calculator is allowed.*

1. (a) Derive an expression for the thermal   5 efficiency of Carnot cycle.

   (b) In an air standard cycle, the air at   5 the begining is at 17° C, 1 bar and 0.856 m³ / kg. The isentropic compression ratio is 15 and 838 kJ/kg heat is added at constant pressure. Find pressure and temperature at each point of the cycle, thermal efficiency and power output of an ideal engine working on this cycle and consuming 0.1 kg of air per second.

2. (a) Explain the working of 4 stroke Otto cycle   6 engine with neat sketch.

   (b) Distinguish between SI and CI engine.   4

3. (a) Enumerate the good characteristics of fuel for SI engine.   5

   (b) What are the liquid fuels ? And list out it's merits and demerits   5

4. (a) How do you classify the ignition systems ? Explain any one type with neat sketch.   5

   (b) What are the requirement of an ignition system for an IC engine ?   5

5. (a) Explain the working of water cooling system with neat sketch. Also list out it's advantages and disadvantages.   6

   (b) Why the cooling is necessary for IC engine ?   4

6. (a) Describe the working of a dry sump lubrication system with neat sketch.   6

   (b) Explain in brief about the crank Case ventilation.   4

7. (a) Describe the various methods of measuring the brake power. Explain any one method.   5

(b) Air consumption for a four-stroke SI engine 5
is measured by means of circular oriffice of
diameter 3.3 cm. The coefficient of discharge
for the oriffice is 0.66 and the pressure across
the oriffice is 170 mm of water. The
barometer reads 760 mm of Hg. The room
temperature is 25° C and stroke volume is
$0.0018 \ m^3$. The compression ratio is 8.5.
The fuel consumption is 0.135 kg/min and
the heating value is 44 MJ/kg. The brake
power at 2600 rpm is 30 kW determine.

(i) volumetric efficiency on the basis of
air.

(ii) The air - fuel ratio.

(iii) Brake mean effective pressure.

8. (a) Discuss the function of intercooling in 5
multistage compression system.

(b) A single stage reciprocating compressor 5
takes in $1 \ m^3$ of air per minitue at 1 bar and
290 K and delivers it at 7 bar. Assume
negligible clearance, the law of compression
is given by $PV^{1.3}$ = constant. Calculate the
indicated power, if the compressor runs at
300 rpm, estimate the cylinder dimensions
assuming L/D = 1.25, isothermal
efficiency, and the actual power applied
when the mechanical efficiency of the
compressor is 0.85 and the transmission
efficiency of the motor driving compressor
is 0.9.

9.   (a)   What are the advantages of closed cycle gas   5
turbine power plant over open cycle gas
turbine power plant ?

      (b)   Explain the working of open cycle gas   5
turbine plant with neat sketch.

10.   Write short notes of the following.   4x2.5=10

     (a)   Producer gas

     (b)   Ignition timing

     (c)   Compression ratio

     (d)   Turbo - charging

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