BME-052

# DIPLOMA IN MECHANICAL ENGINEERING (DME) /ADVANCED LEVEL CERTIFICATE IN MECHANICAL ENGINEERING (DMEVI/ACMEVI)

00328

## Term-End Examination

## June, 2013

## BME-052 : BASICS OF THERMAL ENGINEERING

*Time : 2 hours*                    *Maximum Marks : 70*

*Note : Answer **any five** questions. Use of scientific calculator is **permitted**. Use of steam table, Mollier chart are **permitted**.*

1.  (a)  Explain the following :                    6+8

    (i)   state

    (ii)  path

    (iii) process

    (iv)  cycle

    (b)  50 liters of air at 60°C expands from 7 bar to 1 bar according to the law $PV^n = C$. The volume of air after expansion is 250 liters. Determine the mass of air, and work done during the process.

2. (a) Derive the steady state steady flow energy 6+8
equation for a nozzle. State assumptions
made.

(b) An inventor claims that his new engine will
develop 3.675 kW for a heat addition of
18400 kJ/hr. The source and sink
temperatures of the cycle are 2000°C and
250°C respectively. Examine whether he is
justified in his claim.

3. (a) What is the purpose of steam stop valve ? 6+8
Explain its working with neat sketch.

(b) 1 kg of steam at 10 bar exists at the following
conditions :

(i) Wet and 0.8 dry

(ii) Dry and saturated

Determine the enthalpy, specific volume and
internal energy of the steam in each case.

4. (a) Discuss the advantages of reheating the 4+10
steam in thermal power plants.

(b) In a Rankine power cycle the steam at inlet
to the turbine is 30 bar, dry and saturated
and exhaust pressure is 0.25 bar. Determine
the Rankine cycle efficiency and turbine
power if flow rate is 10 kg/s.

5. (a) Explain the construction and working of 7+7 reaction steam turbine with neat sketch.

   (b) Explain the working principle of Cochrem Boiler with neat sketch.

6. (a) Explain the construction and working of a 7+7 surface condensor with neat sketch.

   (b) Briefly explain the ash handling disposal system.

7. (a) Explain the dimensionless numbers used in 4+10 convection heat transfer.

   (b) A brick work of a furnace is built up of layers laid of fire clay ($K = 0.93$ W/m°C) and red brick ($K = 0.7$ W/m°C) and space between them is filled with diatomite brick ($K = 0.13$ W/m°C). The thickness of fire clay, diatomite and red brick are 12, 5 and 25 cm respectively. Determine the heat loss/m² from the furnace wall and interface temperatures of furnace wall.

8. Write short notes on the following : 7+7

   (a) Tidal Energy

   (b) Solar Energy

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