No. of Printed Pages : **4**

**BIMEE-029**

# DIPLOMA IN MECHANICAL ENGINEERING (DMEVI)

## Term-End Examination

## June, 2013

## BIMEE-029 : POWER PLANT ENGINEERING

*Time : 3 hours* *Maximum Marks : 70*

*Note : Attempt **any five** questions. All questions carry equal marks. Use of steam tables, mollier chart and calculator are permitted.*

**1.** (a) What do you understand by the terms proximate analysis and ultimate analysis of coal ? Discuss briefly. 6

(b) A fuel has the following compositions by mass : 8
Carbon 86%, Hydrogen 11.75%, Oxygen 2.25%. Calculate the theoritical air supply per kg of fuel and the mass of products of combustion per kg of fuel.

**2.** (a) What are the considerations to be made while selecting the suitable site for a coal based thermal power plant ? 6

(b) Consider a steam power plant operating on the simple ideal Rankine cycle. The steam enters the turbine at 3Mpa and 350°C and is condensed at a pressure of 75 kPa. Determine the thermal efficiency of a cycle. 8

3. (a) Distinguish between water tube and fire tube boilers. Also state under what circumstances each type would be desirable ? 6

(b) A boiler is equipped with a chimney of 24 m height. The ambient temperature is 25°C. The temperature of the flue gases passing through the chimney is 300°C. If the air flow through the combustion chamber is 20kg/kg of fuel burned, find the theoritical draught in cm of water as well as in mts of hot gases. 8

4. (a) Write the general energy equation for a steady flow system and from this obtain the energy equation for nozzle. State clearly the assumptions made. 8

(b) Dry and saturated steam enters a nozzle at a pressure of 11 bar and velocity of 80 m/s. The discharge is at 5 bar and the discharge velocity is 500 m/s. The quantity of steam flowing is 2 kg/s and heat loss from the steam is 8 kJ/s. Find out the heat drop and final dryness fraction of steam. 6

5. (a) Define the term "Vaccum efficiency" as applied to a condenser. What are the factors which affect this efficiency ? 4

(b) State and explain the reasons for operating steam power plant with condensers. 3

(c) Steam enters a condenser at 36°C and with barometer reading 760 mm. If the vaccum of 695 mm is produced find vaccum efficiency. 7

6. (a) With neat sketches discuss the different methods of compounding of steam turbine stages. List the advantages and limitations of velocity compounding. 7

(b) In a De Laval steam turbine, steam issues from the nozzle with a velocity of 500 m/s. The nozzle angle is 20°, the mean blade speed is 200 m/s and exit angle of moving blade is 25°. Determine the inlet angle of moving blade, exit velocity of steam and its direction and workdone per kg of steam. 7

7. (a) State the essential elements of a hydroelectric power plant. 4

(b) State the advantages and disadvantages of diesel power plants. 3

(c) Draw a neat sketch of boiling water reactor and explain its working. Also discuss its relative advantages and disadvantages over pressurised water reactor. 7

8. Write short notes on the following **(any four)** 7+7

(a) Equivalent evaporation

(b) Air pre heaters

(c) Head race and tail race

(d) Dalten law of partial pressure

(e) Jet condensers

(f) Excess and deficient air