Roll No. .....

24173

B. Tech 4th Semester(Mechanical Engg.)

Examination - May, 2012

STEAM & POWER GENERATION

Paper : ME-210-F

Time : Three Hours] *[Maximum Marks : 100*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complain in this regard, will be entertained after examination.

Note : (i) Attempt *Five* Questions in total, at least *one* question from each section.
(ii) Question No. 1 is **compulsory**.
(iii) Each question carries equal marks(**20** marks).
(iv) Steam table can be provided.

1. (a) Write **two** important differences between Pump and Condenser. 2

(b) Write importance of Mollier's diagram. 2

(c) Write use of steam table. 2

(d) What is draught ? Write its importance. 2

(e) Draw shape of nozzles for subsonic and supersonic flow. 2

(f) Sources of air leakage in condensers. 2

(g) What do you mean by Stochiometric airfuel ratio. 2

(h) Explain Working Principle of Reaction turbine. 2

(i) Degree of Reaction turbine, explain. 2

(j) Write all specification of Babcock Wilcox boilers. 2

SECTION – A

2. A steam engine is supplied with 90% dry steam at a pressure of 10 bar. The exhaust takes place at 1.1 bar. Determine :

(i) Rankine efficiency,

(ii) Percentage increase in efficiency if the steam has a temperature of 250°C before entering the cylinder. 20

3. The following observation were made in a boiler trial steam Pressure = 10.5 bar, Steam generated = 635 kg/hr. Mass of fuel = 52 kg. Calorific value = 44900 KJ/kg. Feed water temperature = 65°C. Flue gas temperature = 362°C. Cp of gas = 1.005 KJ/kg k. Boiler Room temperature = 21°C. Dryness fraction of steam = 0.975. Draw the Heat Balance Sheet. Take the Percentage composition of fuel by mass C = 84.75, H_2

= 13, S = 1.25, Analysis of dry flue gases by volume $CO_2 = 12.4$, $O_2 = 4.3$, $N_2 = 83.3$. 20

SECTION – B

4. Air enters a nozzle at a Pressure of 3.5 MN/m^2 and at a Temperature of 500°C. It leaves at a Pressure of 0.7 MN/m^2. The flow rate of air through the nozzle is 1.3 kg/s; expansion may be considered to be adiabatic and to follow the law $PV^v = C$.

   Find (a) Throat area, (b) Exit area. 20

5. Explain working of double acting steam engine. What is its diagram factor and thermal efficiency ? 20

SECTION – C

6. The following particulars refers to a stage of a Parson's steam turbine comprising one ring of fixed blade and one ring of moving blades. Mean blade diameter = 700 mm, Speed = 3000 rpm, Steam velocity at blade exit = 160 m/s, Blade outlet angle = 20°, Flow rate of steam = 7 kg/Sec.

   Draw the velocity triangles and determine the blade inlet angle, tangential force on the ring of moving blades and power developed in the stage. 20

7. What is compounding of impulse turbine ? Write its necessity and explain different types of compounding. 20

SECTION – D

8. If the vacuum maintained in a surface condenser is 700 mm of Hg and the barometer reads 760 mm of Hg. The temperature of Condensate is 18°C.

Find : (i) Partial Pressure of air,

(ii) Mass of air per kg of steam and

(iii) Vacuum efficiency. 20

9. A fuel has the following composition by mass Carbon 82%, Hydrogen 13% and remaining is Oxygen. Calculate the minimum air supply per kg of fuel for its complete combustion. Also calculate the Mass of Product of Combustion per kg of fuel. 20