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**ME - 404**

**B.E. IV Semester**

Examination, June 2013

**Thermal Engineering And Gas Dynamics**

**Time : Three Hours**

**Maximum Marks : 70/100**

**Note:** Attempt five questions, one from each unit. User of steam tables, and Mollier chart are permitted.

**Unit - I**

1. a) Describe with neat sketch the working of Loeffler Boiler?  
b) Defines the following terms for the boiler equivalent evaporation, Boiler performance and Boiler Rating.

OR

2. Draw a heat balance sheet for the  
boiler pressure of steam = 15 bar,  
steam condensed = 500 kg/hr,  
fuel used = 70 kg/hr,  
moisture in fuel = 4% by mass,  
mass of dry fuel gases = 8 kg/kg  
of fuel calorific value of fuel = 38,000 kJ/kg  
temperature of flue gases = 350°C  
Temperature of boiler house = 28°C,  
Feed water temperature = 40°C,  
mean specific heat of flue gases = 1 kJ/kg.k  
Dryness fraction = 0.96

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**Unit - II**

3. a) What are the limitations of Carnot cycle?  
b) Derive an expression for efficiency of modified Rankine cycle.

OR

4. A Reheat cycle operating between 30 and 0.05 bar has a super heat and Reheat temperature of 450°C. The first expansion takes place till the system is dry saturated and then reheat is given. Determine the ideal cycle efficiency and neglect feed pump work.

**Unit - III**

5. a) Define the following terms for GDS dynamics and steam nozzle.  
i) Mach cone                      ii) Critical pressure ratio  
iii) Super-saturated flow      iv) Normal shock

OR

6. Calculate mass flow rate of steam in a convergent nozzle with the data given below  
Inlet pressure                      = 10 bar,  
Inlet temperature                = 200°C  
Back pressure                      = 0.5 bar  
Throat diameter                  = 10mm

**Unit - IV**

7. a) Classify rotary compressor?  
b) Explain with neat sketch working of reciprocating compressor?

OR

8. Find the maximum work and power required to drive the compressor for a two stage air compressor which takes  $3\text{m}^3$  at air minute at a pressure of 1 bar and temperature process follows the level  $PV^{1.25} = C$ . Also find the inter cooler pressure.

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**Unit - V**

9. a) Explain various sources of air leakage into steam condenser?  
b) Explain design of Heat-Exchanger.

OR

10. A surface condenser deals with 13625 kg of steam per hour at a pressure of 0.09 bar. The steam enters 0.85 dry and the temperature of the condenser and air extraction pipes is  $36^\circ\text{C}$ . The air leakage amount to be 7.26 kg/hr.

Determine :

- i) The surface area required, if average heat transmission rate is  $3.97 \text{ kJ/cm}^2$   
ii) The cylinder diameter of dry air pump if, it is to be a single acting reciprocating type, runs at 60 rpm with stroke to bore ratio of 1.25 and Volumetric ratio 0.85.

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