Code No.: **53101**

MR 15 – 2015-16 & 2016-17 Admitted Students

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)

Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad.-500 100.

M.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, JULY-2017

SUBJECT: **ADVANCED THERMODYNAMICS**

Branch/Specialization: **ME/ Thermal Engg.**

Time: **3 Hours** Max Marks: **60**

PART-A

Answer the following Questions **5 X 4 Marks=20 Marks**

1. Distinguish between the terms change of state, path and process.
2. Prove that for an ideal gas, $C_p - C_v = R$
3. Explain about a binary vapor cycle
4. Write about Gibb's phase rule
5. List the advantages of Co-generation plant? Where cogeneration plants are used?

PART-B

Answer any 5 questions **5 X 8 Marks=40 Marks**

1. Derive the following Tds equation (4M)
   $Tds = Cv\left(\frac{\partial T}{\partial P}\right)_v dp + C_p\left(\frac{\partial T}{\partial v}\right)_p dV$ and show that the Tds equation may also written as
   $Tds = C_v dT + \frac{\beta T}{k} dV$ (4M)

2. A mass of 0.25 kg of an ideal gas has a pressure of 300 kPa, a temperature of 80 °C, and a volume of 0.07 m^3. The gas undergoes an irreversible adiabatic process to a final pressure of 300 kPa and final volume of 0.10 m^3, during which the work done on the gas is 25 kJ. Evaluate the C_p and C_v of the gas and the increase in entropy of the gas. (8M)

3. a) Write down the Vander waals equation of state. How does it differ from the ideal gas equation of state? (4M)
   b) Do you agree that Specific heats of an ideal gas depend on atomic structure only? If so give your reasons. (4M)

4. In a steam power plant the condition of steam at inlet to the steam, turbine is 20 bar and 300 °C and the condenser pressure is 0.1 bar. Two feed water heaters operate at optimum temperatures. Determine
   a) the quality of steam at turbine exhaust, b) net work done per kg of steam c) cycle efficiency d) steam rate. (Neglect the pump work) (8M)

5. Liquid octane at 20°C is burned with 250% theoretical air at 20°C in a steady flow process. Find the adiabatic flame temperature. (8M)

6. a) Explain Thomson effect. What is Thomson heat? (4M)
   b) Why Onsager's reciprocal relation is often called as the fourth law of thermodynamics? (4M)

7. Draw the vapor compression refrigeration cycle and vapor absorption refrigeration cycles and compare with each other. (8M)

8. a) Draw a neat sketch of Hydrogen- Oxygen fuel cell and explain about it with various chemical reactions. (5M)
   b) What is the biggest loss in a steam plant? How can this loss be reduced? (3 M)

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Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad.-500 100.

M.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, AUGUST-2017

SUBJECT: **ADVANCED FLUID MECHANICS**

Branch/Specialization: **ME/ Thermal Engg.**

Time: **3 Hours** Max Marks: **60**

PART-A

Answer the following Questions **5 X 4 Marks=20 Marks**

1. Derive an expression Bernoulli's equation and state the assumption.
2. Discuss Blasius Solution.
3. Derive an expression for local and mean drag coefficients for different velocity profiles.
4. What are the different methods of preventing the separation of boundary layer.
5. Define and explain the terms: Mach number, Mach Angle and Mach Cone.

PART-B

Answer any 5 questions **5 X 8 Marks=40 Marks**

1. a) Derive the impulse momentum equation. [4M+ 4M]
   b) A 45^0 reducing bend is connected in a pipe line, the diameter at the inlet and outlet of the bend being 600mm and 300mm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet to bend is 8.829N/cm^2 and rate of flow of water is 600litres/sec.

2. a) Derive an expression for the velocity distribution for viscous flow through a circular pipe. Also sketch the distribution of velocity and shear stress across a section of the pipe. [4M]
   b) Two parallel plates are placed horizontally 10mm apart. The bottom plate is fixed and the top plate is moved at a uniform speed of 0.25m/s. The fluid between them has a dynamic viscosity equal to 1.472 N-S/m^2. Determine the pressure gradient which corresponds to the condition of zero discharge between the plates and the shearing stress at each plate. [4M]

3. a) Obtain Von-Karman Momentum integral equation for laminar boundary layer. [4M+4M]
   b) Find the frictional drag on one side of the 200mm wide and 500 long placed longitudinally in a steam of crude oil (specific gravity =0.925, kinematic viscosity=0.9 stroke) flowing with undisturbed velocity of 5m/s. Also find the thickness of boundary layer and the shear stress at the trailing edge of the plate.

4. a) obtain the expression for velocity distribution for turbulent flow in smooth pipe. [4M]
   b) A rough pipe is of diameter 8cm. The velocity at a point 3cm from wall is 30%more than the velocity at point 1cm from pipe wall. Determine the average height of the roughness. [4M]

5. a) what are static and stagnation temperatures? [3M]

b) A tank fitted with convergent nozzle contains air at a temperature of 20^0C. The diameter at the inlet of the nozzle is 25mm, assuming adiabatic flow. Find the mass flow rate of air through the nozzle to the atmosphere when the pressure in the tank is 140kN/m^2 (abs). Take for air R=287J/kg-K and $\gamma = 1.4$. Barometric pressure =100 kN/m^2. [5M]

6. a. Derive Euler's equation of motion. [4M]

b. Derive the Hagen-Poisoulle equation. [4M]

7. a. What is meant by boundary layer? Why do it increase with distance from the upstream edge?

b. Discuss Prandtl Mixing length theory. [4M +4M]

8. Write a Short Notes on **TWO** of the following. [4M+4M]

a. Normal and Oblique Shock Wave.

b. Reynolds theory of turbulence.

c. Von Driest model.

Code No.: **53107**

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Maisammaguda, Dhulapally,(Post Via Kompally), Secunderabad-500 100.

M.TECH I SEMESTER SUPPLEMENTARY EXAMINATIONS, AUGUST - 2017

SUBJECT: **THERMAL AND NUCLEAR POWER PLANTS**

Branch/Specialization: **ME/Thermal Engg.**

Time: **3 Hours** Max. Marks: 60

PART-A

Answer All Questions **5x4M=20M**

1. Explain the different sources of energy? How it leads to classification of different power plants?
2. Enumerate the different steps involved in Gas Turbine Power Plant?
3. List out various components in a Nuclear Reactor? Explain the concepts of "Breeding" in a Nuclear Reactor?
4. Distinguish between Load Factor and Utilization Factor? Explain with one Example each?
5. List out various Flow measuring devices in a Power Plant? Describe briefly any one Flow measuring instrument.

PART – B

Answer any FIVE Questions **5x8M=40M**

1. (a) Describe General Layout of a Steam Power Plant with a neat sketch. How it can be implemented with Coal-fired plant? (4 + 4)
   (b) Discuss the advantages , Disadvantages and Requirements of a Surface Condenser?

2. (a) Explain the working principle of FBC Boiler with a neat sketch. What are the major advantages of FBC over Conventional System? (4 + 4)
   (b) Explain how waste heat recovery system implemented in a Gas turbine power plant?

3. (a) With the help of a neat sketch Explain the working of a Nuclear Power Plant? (4 + 4)
   (b) State the Classification of Nuclear reactors? Explain the necessity of providing 'Shielding' in Nuclear Power Reactor?

4. (a) Discuss the various factors that influencing power plant economics? (4 + 4)
   (b) Enumerate Performance and Operating Characteristics for a nuclear power plant cited as an example?

5. (a) Classify different types of Pollution and suggest suitable methods to control them? (4 + 4)
   (b) Briefly explain different methods of analyzing combustion gases?

6. (a) Describe the Combined Steam and Gas Turbine Plant? (4 + 4)
   (b) Explain the General Layout of a Ash Handling and Dust Collection System.

7. (a) What are the factors considered for site selection to provide nuclear power? Explain One method of enriching Uranium? (4 + 4)
   (b) Briefly explain different energy rates? How do you fix criteria for optimum loads?

8. Answer any TWO of the following: (4 + 4)
   (a) (i) Compounding of Turbines
   (ii) Introduction to IGCC Power Plants
   (b) Write a short notes on application of Nuclear Power Plants?
   (c) (i) Recent developments in Power Generation. (ii) Depreciation in Power Plant.