Code No.: **83114** | **MR18**

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

(Affiliated to JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD)
Gundlapochampally (H), Maisammaguda (V), Medchal (M), Medchal-Malkajgiri (Dist), Hyderabad

M.TECH I SEMESTER REGULAR END EXAMINATIONS, DECEMBER-2018

Subject: **Computational Fluid Dynamics**

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

Time: 3 hours **Max. Marks: 70**

PART – A

Answer ALL questions of the following **5x4Mark=20 Marks**

1. What do you mean by approximate factorization?
2. What is hyperbolic equation? What it exactly represents?
3. What is Navier Stokes equation represents? Explain using momentum Navier stokes equations.
4. Define General Transport equation.
5. What is turbulence? List down the basic features of turbulence.

PART-B

Answer ALL questions of the following **5x 10 Marks= 50Marks**

1. Explain Dirichlet boundary conditions in finite difference method with appropriate Fluid flow problem.

(OR)

2. What do you mean by Finite volume method? Differentiate between finite difference method and finite volume method.
3. State and explain the spurious modes for Runge-Kutta cell vertex formulation in FVM.

(OR)

4. What are the various implicit schemes in CFD? Discuss it briefly.
5. Explain SIMPLER pressure correction algorithm for an incompressible viscous fluid flow and its steps.

(OR)

6. Prepare a flow chart of Semi Implicit Pressure Linked Equation algorithm for Viscous Flow using an appropriate fluid problem.
7. Explain central differentiating approximation method to solve one dimensional steady state diffusion problem.

(OR)

8. What do you mean by upwind differentiating scheme? Write a short note on assessment of upwind differentiating scheme.
9. Explain K-Epsilon turbulence model and write down its advantages over other turbulence computational models.

(OR)

10. Briefly explain methods to calculate turbulent flow.

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M.TECH I SEMESTER REGULAR END EXAMINATIONS, DECEMBER-2018

Subject: **Thermal & Nuclear Power Plant Engineering**

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

Time: 3 hours **Max. Marks: 70**

PART – A

Answer ALL questions of the following **5x4Mark=20 Marks**

1. Briefly explain the natural draught cooling tower with neat sketch?
2. On which cycle gas turbine plant works and draw neat layout and also explain T-S diagram?
3. What is the function of moderator? What is the criterion of its effectiveness?
4. Define (i).Connected load (ii).Demand (iii).Plant capacity factor (iv).Utilization factor
5. Classify the Temperature measuring instruments?

PART-B

Answer ALL questions of the following **5x 10 Marks= 50Marks**

1. (a) What is the purpose of feed water heating system in steam power plant?
   (b) Explain how combustion takes place in overfeed strokes with neat diagram? Discuss their relative performance with underfeed strokes system.

(OR)

2. (a) Describe the pneumatic ash handling system in a modern steam power plant?
   (b) What are the classification of condenser? Explain the surface condenser with neat diagram and mention their advantages
3. What are methods to improve the gas turbine plant efficiency explain with suitable diagrams?

(OR)

4. (a) What are the advantage and disadvantage of fluidized bed combustion?
   (b) A simple closed cycle gas turbine plant receives air at 2 bar and 25° C and compresses it to 6 bar and then heats it to 900^0 C in the heating chamber. The hot air expands in gas turbine back to 1 bar. Calculate the power developed per kg of air supplied per second. Find the thermal efficiency of cycle?
5. (a) Briefly explain the characteristics of PWR system with neat sketch?
   (b) Write the advantages of Gas cooled reactors?

(OR)

6. Explain the Economics parameters in Nuclear power plant? And mention the future of plant
7. (a) What are the factors affecting Economics of generation and distribution of power?
   (b) Explain (i). Load curve (ii). Load duration curve

(OR)

8. The yearly duration curve of a certain plant can be considered as a straight line from 150 MW to 40 MW. Power is supplied with one generating unit of 100 MW capacity and two units of 50 MW capacity each. Determine:
   (i) Installed capacity (ii) Load factor (iii) Plant factor
   (iv) Maximum demand (v) Utilization factor.
9. Briefly explain the following
   (i) Resistance thermometers (ii)Electrical level gauge (iii) Flow meters.

(OR)

10. what is the need of gas analyzers? With neat sketch explain
    i).Measurement of CO_2 ii) Measurement of O_2 iii) Measurement of CO.

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M.TECH I SEMESTER REGULAR END EXAMINATIONS, DECEMBER-2018

Subject: **Process Heat And Mass Transfer**

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

Time: 3 hours **Max. Marks: 70**

PART – A

Answer ALL questions of the following **5x4Mark=20 Marks**

1. Define effectiveness of fin and express it in terms of Biot Number
2. Explain Reynolds analogy
3. Explain boiling curve and name different stages on it.
4. Differentiate explicit and implicit functions
5. State and define any two dimensionless numbers used in mass transfer

PART-B

Answer ALL questions of the following **5x 10 Marks= 50Marks**

1. The cylindrical head of an engine is 1 m long and has an outside diameter of 50 mm. Under typical conditions, the outer surface of the head is at a temperature of 150°C and is exposed to ambient air at 40°C with a convective coefficient of 24 W/m^2-K. The head has been provided with 12 longitudinal straight fins which are 0.75 mm thick and protrude 2.5 cm from the cylindrical surface Workout the increase in heat dissipation due to addition of fins. Also calculate the temperature at the centre of fin. It may be presumed that the fins have insulated tips and that thermal conductivity of cylinder head and fin material is 70 W/m-K.

OR

2.a. Write short notes on gas radiation

b. Derive steady state temperature distribution equation for a plane slab in single coordinate system without heat generation

3.a. Write short notes on k-epsilon turbulence model

b. Water at 60°C enters a tube of 25 mm diameter at a mean flow velocity of 20 m/s. Calculate the exit water temperature if the tube is 3.0 m long and the wall temperature is constant at 80°C

OR

4. a. Derive momentum equation

b. Air at 27°C and 1 atm flows over a flat plate at a speed of 2m/s. Plate is heated over its entire length to a temperature of 60°C. Calculate the heat transferred in the first 0.2 m of the plate.

5. A vertical cooling fin, approximating a flat plate 40 cm in height is exposed to steam at atmospheric pressure. If the surface of the fin is held at 80°C, make calculations for i) film thickness at the bottom edge of the fin, ii) overall heat transfer coefficient, iii) heat transfer rate iv) condensate mass flow rate . Assume unit width of the fin and check the flow Reynolds number for the assumption of the laminar flow.

OR

6. The engine oil at 150°C is cooled to 80°C in a parallel flow heat-exchanger by water entering at 25°C and leaving at 60°C. Estimate the heat exchanger effectiveness and number of transfer units. If the fluid flow rates and inlet conditions remain unchanged, workout the lowest temperature to which the oil may be cooled by increasing the length of exchanger.

7. The block is 1 m square. The left face is maintained at 100°C and the top face is maintained at 500°C while other faces are exposed to an environment at 100°C with convective heat transfer coefficient of 10 W/m^{2o}C and thermal conductivity of block is 20 W/m°C. Determine nodal equations at central nodes from fundamentals of numerical heat transfer method

OR

8. A layer of glass (k= 0.8 W/m o C) 3 mm thick has thin 1 mm electric conducting strips attached to the upper surface. The bottom surface of the glass is insulated, and the top surface is exposed to a convection environment at 30° C with heat transfer coefficient 100 W/m^{2o}C . The strips generate heat at the rate of 20 W per meter of the length. Determine steady state temperature distribution equation (nodal equations) in a typical glass section using fundamental principles of numerical method for heat generation rate

9. Water is available at the bottom of well which is 25 mm in diameter and 5 m deep. Estimate the diffusion rate into dry atmospheric air at 25°C. The diffusion coefficient for the system is approximated to be 0.0925 m^2/h and the atmospheric pressure is 1.032 bar.

OR

10. Air at 1 atmosphere and 25°C containing small particles of iodine, flows with the velocity of 5.25 m/s inside a 30 mm diameter tube. Calculate mass transfer coefficient for iodine. The thermo-physical properties of air are Kinematic viscosity = 15.5 × 10^{-6} m^2/s, Diffusivity= 0.82 ×10 $^{-5}$ m^2/s.

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M.TECH I SEMESTER REGULAR END EXAMINATIONS, DECEMBER-2018

Subject: **Advanced Thermodynamics And Combustion**

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

Time: 3 hours **Max. Marks: 70**

PART – A

Answer ALL questions of the following **5x4Mark=20 Marks**

1. Write a note on Saturation Temperature and Saturation Pressure
2. Discuss the concept of equilibrium constant for ideal-gas mixture
3. List out the various energy levels in statistical thermodynamics
4. Distinguish between diffusion and combustion process
5. How an Orsat gas analyzer works?

PART-B

Answer ALL questions of the following **5x 10 Marks= 50Marks**

1. A 0.9-m^3 rigid tank is divided into two equal compartments by a partition. One compartment contains Ne at 20°C and 100kPa, and the other compartment contains Ar at 50°C and 200kPa. Now the partition is removed, and the two gases are allowed to mix. Heat is lost to the surrounding air during this process in the amount of 15 kJ. Determine (i) the final mixture temperature and (ii) the final mixture pressure

(OR)

2. Octane (C_8H_{18}) is burned with dry air. The volumetric analysis of the products on a dry basis is CO_2: 10.02 percent O_2: 5.62 percent CO: 0.88 percent N_2: 83.48 percent. Determine (i)The air–fuel ratio, (ii) the percentage of theoretical air used, and (iii) the amount of H_2O that condenses as the products are cooled to 25°C at 100kPa
3. Derive an expression to determine the entropy change of a real gas

(OR)

4. A mixture of 2kmol of CO and 3kmol of O_2 is heated to 2600 K at a pressure of 304kPa. Determine the equilibrium composition, assuming the mixture consists of CO_2, CO, and O_2
5. Discuss in detail any one statistical model approach for classical thermodynamics

(OR)

6. Write a note on Fermi-Dirac statistics function with appropriate formulas
7. Classify various alternative fuels discussing its chemical structure, properties and applications to reduce pollutions

(OR)

8. Discuss the concepts behind circulating fluidized bed combustion
9. Explain the working of a gas analyzer with neat sketch, discussing its various major components to estimate the emission levels

(OR)

10. Write a note on emission standards for various power plants indicating the ppm limits of various harmful gases

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M.TECH I SEMESTER REGULAR END EXAMINATIONS, DECEMBER-2018

Subject: **Research Methodology and IPR**

Branch/Specialization: **Common to CE. EEE, ME & CSE / SE, EPS, TE, MD & CSE**

Time: 3 hours **Max. Marks: 70**

PART – A

Answer ALL questions of the following **5x4Mark=20 Marks**

1. Define research. Explain its significance and scope.
2. Explain "components of research problems".
3. Define the term intellectual property rights.
4. What do you mean by the term "trademark"? Write about its purpose and functions.
5. Define the term copyright. Discuss its nature.

PART-B

Answer ALL questions of the following **5x 10 Marks= 50Marks**

1. Explain various approaches of investigation of solution for research problem.

(OR)

2. What are the steps involved in research process.
3. What is research report? How to write research report.

(OR)

4. Explain the format of research proposal.
5. Explain the procedure for registration of copyright.

(OR)

6. Write about the various Indian Acts enacted for the protection of IPRs. State their basic Objectives.
7. Describe the patent information and data bases.

(OR)

8. Explain about licencing of patent rights and transfer of technology..
9. Comment on the recent developments of patent laws and the International laws On the Patents

(OR)

10. Explain the administration of patent system in IPR