Code No.: **53115** MR 15

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

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

M.Tech II Semester Supplementary Examinations, DECEMBER-2017

SUBJECT: **Advanced Heat And Mass Transfer**

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

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

PART – A

Answer All Questions **5 x 4Marks=20 Marks**

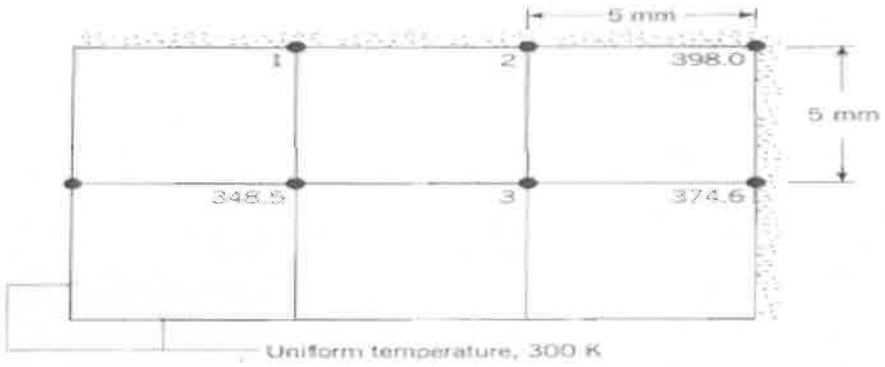
1. Briefly explain use of heislers chart.
2. Explain briefly about thermal entry regions.
3. Explain different types of condensation.
4. Briefly explain about combined free and forced convection.
5. Classify heat exchangers.

PART-B

Answer any five of the following questions **5 x 8 Marks= 40 Marks**

1. (a) Derive expressions for temperature distribution during steady state heat conduction in a solid sphere.
   (b) Steel balls of dia 0.2 m for a large bearing are to be cooled in a salt bath after heating to 720°C. The bath is at 160C. The convection coefficient is 35 W/m^2K. Determine the time required for the ball surface to reach 230°C. Density = 7865 kg/m^3, specific heat = 461 j/kgk. Thermal conductivity = 12.8 W/mK. Also calculate the centre temperature and average temperature for this period of cooling.

2. Steady state temperatures (K) at 3 nodal points of a long rectangular rod are shown in the figure. The rod experiences uniform vlumetric generation rate 5 X 10^7 W/m^3 and has a thermal conductivity of 20 W/mK. Two of its sides are maintained at constant temerature of 300K, while others are insulated.



   (a) Determine temperatures at node 1, 2 and 3.
   (b) Calculate the heat transfer rate per unit length (W/m) from the rod using nodal temperatures. Compare this result from the heat rate calculated from the knowledge of volumetric generation rate and rod dimensions.

3. (a) State and explain momentum equation.

   (b) What is dimensional analysis and how it is used for forced convection method.

4. Air at 14 atm pressure flows through a 75 mm ID pipe at a rate of 0.55 kg/s, the duct wall being at 20°C. The average air temperature at inlet is 60°C. The duct is 6 m long. Estimate the temperature of air as it leaves, the duct.

5. A thin wall container of length 200 mm with a hot process fluid at 50°C is placed in a quiescent cold water bath at 10°C. Heat transfer at inner and outer surface of the container may be approximated by free convection from a vertical plate. Determine the overall heat transfer coefficient between hot process fluid and cold water bath. Assume the properties of hot process fluid as that of water.

6. Food preparation in the form of horizontal cylinder of 5 cm dia is to be heated by condensation of steam over its surface. Compare the heating rates when the surface is at 40°C for steam temperatures of 100°C and 120°C.

7. (a) Derive an expression for LMTD of counter flow heat exchanger.

   (b) A well is 40 m deep and 9 m dia and the atmospheric temperature is 25°C. The air at the top is having relative humidity of 50%. Determine the rate of diffusion of water vapour through the well D= 2.58 X 10^{-5} m^2/s.

8. write short notes on any two of the following

   (a) Types of Fins.

   (b) Energy Equation.

   (c) Types of Boiling.

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M.Tech II Semester Supplementary Examinations, DECEMBER-2017

SUBJECT: **Computational Fluid Dynamics**

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

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

PART – A

Answer All Questions **5 x 4Marks=20 Marks**

1. What is the difference between FVM and FEM?
2. Explain the second order one-dimensional wave equation ?
3. Derive the potential equation?
4. Discuss about formulations for two dimensional problems?
5. Explain about steady state?

PART-B

Answer any five of the following questions **5 x 8 Marks= 40 Marks**

1. Solve the following algebraic equations using direct method with Gaussian elimination
   x-2y+2z=0
   2x+2y+3z=3
   -x+3y=2

2. Derive the expression for stability Criteria for finite difference solution of one dimensional heat conduction using Von-neumann analysis

3. A steel rod of length 50cm diameter 2cm and thermal conductivity 55 W/m K is kept at temperature of 150^0 C at its base the fin is exposed to fluid of heat transfer coefficient 15 W/m^2K and temperature at 120^0C. Obtain the temperature distribution for the fin using finite difference method. The tip of the fin is kept at 50^0C

4. What are the different methods to solve the convection and diffusion terms in the generalized partial differential equation ?write about central difference and upwind schemes in details?

5. Differentiate between explicit and implicit approaches in CFD?

6. Explain the need for turbulence modeling dealing with CFD problems?

7. What is SIMPLER algorithm? How it is different from SIMPLE algorithm?

8. Write short notes on any two of the following
   a) Staggered Grid method
   b) Ranga- kutta Method
   c) Various computer graphics techniques used in CFD?

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M.Tech II Semester Supplementary Examinations, DECEMBER-2017

SUBJECT: **Energy Management**

Branch/Specialization: **ME/ Common to Machine Design & Thermal Engg.**

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

PART – A

Answer All Questions **5 x 4Marks=20 Marks**

1. Explain the Principles of energy management?
2. Explain briefly about the design procedure for conservation of energy materials?
3. Explain the significance and role of risk analysis in a process industry?
4. Discuss briefly about the pros and cons of the Common methods of analysis while evaluating the project?
5. Explain the types of thermal storage systems?

PART-B

Answer any five of the following questions **5 x 8 Marks= 40 Marks**

1. (a) Discuss necessary steps involved in Energy Management Program. Explain briefly scope and principles of Energy Management?
   (b) What are the Qualities and Functions of an Energy Manager. How he initiates, Organizes and Manages Energy Management. [4 + 4]

2. (a) Explain how data gathering takes place in an Energy Audit? Design a suitable data collection form for Audit in a CC Building?
   (b) Write a Brief note on Energy Flow Networks with application. Give symbols for representation in a Net work? [4 + 4]

3. (a) Explain the concept " Time Value of Money" in Economic Analysis of a Project". Illustrate with at least two examples.
   (b) What is meant by "Risk Analysis". Discuss various factors involving risk analysis? [4 + 4]

4. (a) Discuss the importance and scope of Replacement Project analysis with a Case study example.
   (b) Explain the terms " Payback" and Present Worth in Evaluating the Project? [4 + 4]

5. (a) Explain different alternate energy sources? Compare merits and demerits of solar, wind and hydroelectric energy?
   (b) How do wind turbine works? Explain different types of wind turbines with a sketch? [4 + 4]

6. (a) Draw an organizational structure for an Energy management. Explain different energy programs to run energy management successfully?
   (b)Discuss the various steps of conducting detailed energy audit? [4 + 4]

7. (a): Briefly describe about "annualized project cost" and "Investors rate of return". [4 + 4]
   (b): How do you characterize Investment project? Briefly describe budget considerations related to it?

8. Answer any **TWO** [2 X 4 = 8]
   a) Solar Energy Devices b) Internal rate of return c) Critical assessment of energy usage.