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 (MR18) REGULAR END EXAMINATIONS, MAY-2019
Subject: <u>Advanced Refrigeration & Air Conditioning</u>
Branch: **Thermal Engineering**

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

PART – A

Answer **ALL** questions of the following   **5x4Marks=20 Marks**

1. With a p-h diagram show the standard rating of a cycle for domestic refrigerator.
2. What do you understand by 'cryogenics'? Discuss the limitations of vapour compression refrigeration system for production of low temperature
3. Derive the formula for finding out the quantity of steam required per ton of refrigeration
4. Explain the adiabatic mixing of two air streams with a neat diagram
5. What are the major difficulties experienced in air – conditioning a car?

PART-B

Answer **ALL** questions of the following   **5x10Marks=50Marks**

1. a) Explain the concept of Ozone layer depletion? List some ODPs of refrigerants.
    b) Calculate the power needed to compress 20 kg/min of ammonia from saturated vapour at 1.4 bar to a condensing pressure of 10 bar by two-stage compression with intercooling by liquid refrigerant at 4 bar. Assume saturated liquid to leave the condenser and dry saturated vapours to leave the evaporator. Use p-h chart. Determine, also, the power needed when intercooling is not employed

(OR)

2. a) Describe, with the help of schematic and p-h diagrams, the working of a two stage compression system with water intercooler, liquid intercooler and a liquid flash chamber
    b) A R134a machine operates at -15^0C evaporator and 35^0C condenser temperatures. Assuming a simple-saturation cycle, calculate the volume of the suction vapour and power consumption per ton of refrigeration and COP of the cycle.
    Calculate the same if the system has a regenerative heat exchanger with the suction vapour leaving at 20^0C from the heat exchanger

3. a) Explain the working of a system used for the production of dry ice
    b) In a lithium bromide – water system the condenser and evaporator temperatures are 35^0C and 8^0C respectively. The generator temperature is 85^0C and the absorber temperature is 30^0C. Assume a pressure drop of 2.5 mm Hg between the generator and condenser and 1 mm Hg between the evaporator and absorber. Determine the heat rejection rates in the condenser and absorber per unit of refrigerating capacity. Also find the heat input to the generator, and COP

(OR)

4. a) Sketch and explain a cascade refrigeration system. Draw cascade refrigeration cycle on temperature – entropy and pressure – enthalpy diagrams
    b) The following data refer to a liBr + H_2O absorption system:
    Generator temperature = 80^0C; Condenser temperature = Absorber temperature = 30^0C; Evaporator temperature = 10^0C; Condenser temperature = 25^0C.
    Steam enters the generator heating coil at 120^0C (dry-saturated state steam) and leaves it at 100^0C as condensate. The concentration of liquid leaving the generator is 0.65 and its enthalpy is – 75 kJ/kg. The concentration of liquid leaving the absorber is 0.51 and its enthalpy is – 170 kJ/kg. The enthalpy of vapour leaving the generator is 2620 kJ/kg. The flow rate through the evaporator is 0.5 kg/s.
    Find: 1. Pressure in generator, condenser, evaporator and absorber in mm of mercury head;
    2. Tonnage; 3. Heat rejection to condenser and absorber; 4.C.O.P; and 5. Relative C.O.P.

5. a) Explain the working principle of vortex tube with a suitable sketch? What are the advantages of vortex tube over other refrigeration systems?

    b) The ambient conditions for an aircraft cruising at 1000 km/h are 0.35 bar and – 15^{0}C. The cabin temperature is 25^{0}C and turbine exit pressure is 1.06 bar. The pressure ratio of the compressor is 3. Assuming 100% efficiency for ram effect, compressor and turbine and ideal heat exchangers, determine for simple gas refrigeration cycle of 20 TR capacity:

    1. Temperatures and pressures at all points of the cycle

    2. Mass flow rate and volume flow rates at compressor inlet and turbine outlet; and, 3. Work requirement and COP

    Assume c_p = 1.005 x 10^3 J/kg K; R_{air} = 286 J/kg K; and γ = 1.4.

(OR)

6. a) Under what situation is steam jet refrigeration system recommended? What are its limitations? Can it be used for obtaining sub – zero temperatures?

    b) Explain the working principle of pulse tube refrigeration system. What are the fields of its applications?

7. a) Why ventilation is required? Explain why different ventilation standards for different purposes are recommended?

    b) The air-handling unit of an air-conditioning plant supplies a total of 4500 cmm of dry air which comprises by weight 20% fresh air at 40 ^{0}C DBT and 27 ^{0}C WBT, and 80% recirculated air at 25 ^{0}C DBT and 50% RH. The air leaves the cooling coil at 13 ^{0}C saturated state. Calculate the total cooling load, and room heat gain

(OR)

8. a) The following data refer to air conditioning of a public hall:

    Outdoor conditions = 40 ^{0}C DBT, 20 ^{0}C WBT

    Required comfort conditions = 20 ^{0}C DBT, 50% RH

    Seating capacity of hall = 1000

    Amount of outdoor air supplied = 0.3 m^3/min/person

    If the required condition is achieved first by adiabatic humidifying and then cooling, find:

    (i) The capacity of the cooling coil and surface temperature of the coil if the by-pass factor is 0.25; and

    (ii) The capacity of the humidifier and its efficiency

9. With a line diagram show the basic components of automobile air-conditioning system and explain their working principle

(OR)

10. Explain the working principle of automatically controlled air conditioning system of an automobile with a sketch

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M. Tech. II SEMESTER (MR18) REGULAR END EXAMINATIONS, MAY-2019
Subject: **Energy Conservation & Management**
Branch: **Thermal Engineering**

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

PART – A
Answer **ALL** questions of the following   **5x4Marks=20 Marks**
1. Explain the different types of instruments used for energy audit.

2. How to save energy in Refrigeration and Air Conditioning plant?

3. What are the advantages of CFL lamp (compact fluorescent lamp) over incandescent lamps?

4. How does an industry, nation and globe would benefit from energy efficiency programs?

5. Write short note on economical analysis of PV module.

PART-B
Answer **ALL** questions of the following   **5x10Marks=50Marks**

1.a	Explain the different phases of energy audit.	5M
b	What are the responsibilities and duties of energy manger in an industry?	5M
	or	
2.a	Why material and energy balance crucial for energy audit?	5M
b	What is energy security and what is Indian government strategy for future to meet energy security.	5M
3.a	What is waste heat recovery techniques and thermal insulation in thermal system?	5M
b	What is boiler efficiency? Explain the direct and indirect methods of finding the efficiency of boiler.	5M
	or	
4.	What are the general principles of electrical energy management for lighting?	10M
5.a	Explain how energy efficient motors are different from normal motors?	5M
b	What are the different Control techniques used for Efficient Lighting?	5M
	or	
6.a	What is meant by Maximum Demand Controllers, explain in detail?	5M
b	How demand side management helps in energy conservation?	5M
7.	Considered your college as reference, list all the possible energy conservation measures possible in lighting system?	10M
	or	
8.	A multi-storied shopping mall has installed 5 x 110 TR reciprocating compressors of which four compressors are in use for 16 hours per day. Due to higher energy, cost shopping mall chief engineer has decided to replace reciprocating compressors with screw compressors. Chief engineer need following input from energy consultant.	

     i. Comparison of power consumption of both reciprocating and screw compressors?

     ii. Annual cost savings (for 350 days operation). Present unit cost Rs 6.50 per kWh, investment for 220 TR machine Rs 30 lakh.

     iii. What should be the size of cooling tower required for proposed screw compressors?

9.a Explain briefly the various elements of a monitoring and targeting system. 5M

b Use CUSUM technique and calculate energy saving for 6 months period of 2018. For 5M
calculating total energy savings, average production can be taken as 4000MT/Month.
Refer data given in table below

2018-Month	Actual SEC, Kwh/MT	Predicted SEC, Kwh/MT
Jan	242	265
Feb	238	265
Mar	287	265
Apr	237	265
May	295	265
Jun	246	265

or

10 Briefly discuss Energy Conservation(EC) Act 2001 and its features 10M

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M. Tech. II SEMESTER (MR18) REGULAR END EXAMINATIONS, MAY-2019
Subject: __Advanced Fluid Mechanics__
Branch: **Thermal Engineering**

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

PART – A
Answer **ALL** questions of the following   **5x4Marks=20 Marks**

1. Differentiate between stream line and streak line.

2. What is the basic difference between the Euler's equations of motion and the Navier Stokes equations?

3. Explain Prandtl's boundary layer theory in brief.

4. Explain Equations for velocity distribution and frictional resistance in the smooth pipe.

5. What is Mach number? Explain significance of the Mach number.

PART-B
Answer **ALL** questions of the following   **5x10Marks=50Marks**

1. For the flow represented by the following stream functions, determine the velocity component and check for the irrationality.
   (a) $\Psi = xy$ (b) $\Psi = \ln(x^2 + y^2)$
   (OR)
2. Derive an expression for three dimensional Bernoulli's continuity equation.
3. Derive an expression for Navier Stokes equation for incompressible fluid flow.
   (OR)
4. Explain Hagen Poiseeuille Flow though pipe using suitable expressions and sketch.
5. Explain Von-Karman momentum integral equation for laminar boundary layer.
   (OR)
6. State the assumptions under which the boundary layer equations for flow over a flat plate are valid. Explain with a neat sketch the boundary layer characteristics when a fluid is flowing over a flat plate.
7. Explain K-epsilon turbulence model.
   (OR)
8. What do you mean by Prandtl's Mixing length theory and find out the expression for shear stress due to Prandlt?
9. Air flows isentropically through a conversing nozzle attached to a large tank where the absolute pressure is 171 kPa and the temperature is 27° C. At the inlet section, the Mach number is 0.2. The nozzle discharges into the atmosphere through an area 0.015 m^2. Determine the magnitude and direction of the force that must be applied to hold the nozzle in place.
   (OR)
10. What do you mean by Normal shocks in the flow. Explain Fanno and Rayleigh Lines.

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M. Tech. II SEMESTER (MR18) REGULAR END EXAMINATIONS, MAY-2019
Subject: New & Renewable Energy Sources
Branch: **Thermal Engineering**

Time: 3 hours   Max. Marks: 70

PART – A

Answer **ALL** questions of the following   5x4Marks=20 Marks

1. Explain about availability coal, oil & natural gas in India.

2. Compare Flat plate and concentrating solar collectors.

3. List the factors influencing wind.

4. Explain the importance of biomass.

5. Explain working principle of ocean thermal energy conversion.

PART-B

Answer **ALL** questions of the following   5x10Marks=50Marks

1. Discuss the hydropower and nuclear power utilization in past and present consumption pattern.
(OR)
2. Discuss the environmental impact of fossil fuels thermal energy scenario in India.
3. (a) Draw neat sketch of pyrometer and explain its working
   (b) Explain the solar heating and cooling with neat sketch.
(OR)
4. (a) Classify solar collectors.
   (b) Explain the working of concentrating collectors with neat sketch.
5. (a) Write a note on site selection for wind power plant.
   (b)Compare horizontal and vertical wind mills.
(OR)
6. Explain working of horizontal wind mill with neat sketch.

7. (a) Classify biogas plants.
   (b)Explain working of any one type of biogas plant with neat sketch.
(OR)
8. (a) Explain biomass conversion process.
   (b) Discuss advantages and disadvantages of biogas plants.

9. Classify tidal energy conversation plants and explain briefly with neat sketch any two types.
(OR)
10. (a) Explain working principle of fuel cell and list its types.
    (b)Discuss about applications of fuel cells.