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, JANUARY-2018

SUBJECT: ADVANCED THERMODYNAMICS

Branch/Specialization: ME/Thermal Engineering

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

PART – A

Answer All Questions   5 x 4 Marks=20 Marks

1. Explain about Joule Thomson coefficient.

2. Explain Gibbs phase rule.

3. Briefly explain entropy change of reacting system.

4. What do you understand by thermodynamic probability and explain?

5. Write a note on thermionic power generation.

PART-B

Answer all questions   5 x 8 Marks= 40 Marks

1. a) Explain mechanical, thermal and chemical irreversibility.

   b) 80 kg of water at $100^{\circ}c$ are mixed with 50 kg of water at $60^{\circ}c$, while the temperature of the surrounding is $15^{\circ}c$. Determine the decrease in available energy.

(OR)

2. a) Explain about availability with examples.

   b) Write a note on thermodynamic potential.

3. Write a note on different equations of state.

(OR)

4. Describe briefly about generalized compressible charts along with its importance.

5. a) Discuss about chemical potential & phase equilibrium.

   b) Explain heat of reaction and adiabatic flame temperature.

(OR)

6. a) Explain importance of thermochemistry

   b) Explain first law analysis for reacting systems.

7. a) Explain the concept of fermi Dirac statistics.

   b) Explain about degeneracy of energy levels.

(OR)

8. a) Explain about Maxwell – Boltzmann statics in statistical thermodynamics.

   b) Write about partion function.

9. a) Write a detailed note on thermoelectric phenomena.

   b) Write working of principle of MHD.

(OR)

10. Classify fuel cells and their working with neat sketch

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M.TECH I SEMESTER REGULAR END EXAMINATIONS, JANUARY-2018
SUBJECT: ADVANCED I.C. ENGINES
Branch/Specialization: ME/Thermal Engg.

Time: 3 hours   Max. Marks: 60

PART – A

Answer All Questions   5 x 4Marks=20 Marks

1. Write the importance of supercharging

2. Write the desirable properties of CI engine fuels

3. Write the importance for measurement of exhaust gas temperature?

4. What is trans-esterification? List down any two vegetable oils.

5. What are the factors to be considered for modifications in IC engines to suit bio-fuels?

PART-B

Answer All questions   5 x 8 Marks= 40 Marks

1. Briefly explain the stages of combustion in SI engine elaborating the flame front propagation.

(OR)

2. Explain the effect various engine variables in SI engine knock.

3. Describe diesel fuel spray behavior and spray structure with neat sketch.

(OR)

4. Explain the three phases of CI engine combustion.

5. Discuss briefly about hydro carbon emission in CI engine.

(OR)

6. Explain briefly abut catalytic converter with neat sketch.

7. Explain the performance combustion and emission characteristics of CI engine using bio-fuels.

(OR)

8. Discuss the methods of using alcohol as fuel in S.I and C.I engines.

9. Explain about learn burning and adiabatic concept in modern trends in IC engines.

(OR)

10. Discuss the following on Hybrid Electric Vehicle.

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M.TECH I SEMESTER REGULAR END EXAMINATIONS, JANUARY-2018
SUBJECT: <u>ADVANCED FLUID MECHANICS</u>
Branch/Specialization: **ME/Thermal Engg.**

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

PART – A

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

1. Define Bernoulli's equation and momentum equation.

2. Explain briefly Hagen-Poiseuille equation.

3. How are the thickness of boundary layer, shear stress along the flat plate determined by Von Karman momentum equation.

4. Explain K-epsilon model.

5. How does a nozzle differ from a diffuser explain clearly?

PART-B

Answer All questions   **5 x 8 Marks= 40 Marks**

1. Sketch the stream lines represented by $\psi = x^2 + y^2$ also find out the velocity and its direction at point (1,2)

(OR)

2. What do you understand by the terms i) Total acceleration ii) Convective acceleration iii) Local acceleration.

3. Calculate the velocity and pressure fields, and estimate the shear force per unit area acting on the bottom plate considering the external pressure gradient (**Couette flow).**

(OR)

4. Derive from fundamentals Navier Stoke's equation for compressible flow.

5. Explain the Prandtl's boundary layer theory?

(OR)

6. A torpedo which has a surface area of 2.5 m2 and length 1.5 m is launched in sea water at a speed of 6.5 m/sec. Assuming the boundary layer to be fully turbulent, determine the surface drag and the maximum boundary layer thickness. Assume density and viscosity of sea water 1025 kg/ m3 and 0.0156 poise.

7. Describe Prandtl's Mixing length theory

(OR)

8. a) What do you understand by the hydraulically smooth and rough pipes?

   b) A pipe line 12 cm in diameter and 100 m long conveys water at the rate of 0.075 m3/s. The average height of the surface protrusions is 0.012 cm and the coefficient of friction is 0.005. Calculate the loss of head, wall shearing stress, centre line velocity and nominal thickness of laminar sub layer. For water ρ = 1000 kg/m3, υ = 0.01 stokes.

9. Air (R = 287 J/kg K and γ = 1.4) enters a straight duct at 27^0 C, 3.5 bar, 120m/s and leaves the duct at 5^0 C, 2.1 bar, 240m/s. The duct cross sectional area at the entry is 500 cm^2. Assuming adiabatic flow. Calculate stagnation temperature, maximum velocity, mass flow rate and area of cross section at exit.

(OR)

10. Explain clearly Fanno and Rayleigh Lines? With the help of T – S diagram explain the different flow patterns in Rayleigh Line?

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

SUBJECT: <u>REFRIGERATION & AIR CONDITIONING</u>

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

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

PART – A

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

1. Explain with a neat sketch flash chamber.

2. Derive the expression for C.O.P of absorption system.

3. What are the factors considered in selecting the refrigeration system for aero planes?

4. Explain how the psychometric chart is prepared.

5. What methods are adopted for factory air-conditioning?

PART-B

Answer All questions   **5 x 8 Marks= 40 Marks**

1. Explain the p-h diagram different methods of improving C.O.P.

(OR)

2. An ammonia refrigeration system working between 1.4 bar and 10 bar is provided with flash intercooler at 4 bar and compression is carried out in two stages. The refrigerant leaves the condenser in saturated liquid and leaves the evaporator in saturated vapour. If the mass flow through the evaporator is 0.3 kg/sec.calculate the power required to run the system and evaporator load in TOR. (b) Also find the power required if the compression is carried out in one stage only.

3. With a neat sketch explain lithium-Bromide refrigeration system.

(OR)

4. In a absorption refrigeration system, the generator condenser and evaporator temperatures are 110^0c, 3^0c and -10^0c respectively. Find ideal COP of the system. Find the change in COP in the following cases occurring independently. (i) Generator temperature increases by 30^0c. (i) Condenser temperature decreases by 8^0c (iii) evaporator temperature rises by -10^0c.

5. Explain steam jet refrigeration system, and list out the advantages and limitations.

(OR)

6. An air refrigeration machine maintains -10^0c in refrigerator. The cold air is drawn by the compressor at 1 bar and compressed isentropically to 5 bar and then cooled at 30^0c at that pressure. Then the air is explained to the original pressure and then admitted to cold chamber. If the air flow through the system is 800 kg/hr, find (a) cooling capacity of the system in TOR (b) power required to run the machine (c) COP of the system.

7. The DBT and WBT of atmospheric air are 35^0c and 23^0c respectively when the barometer reads 75cm of hg. Determine (i) relative humidity (ii) humidity ratio (iii) dew point temperature (iv)density (v) enthalpy of atmospheric air. Use carrier equation as given below where pressures are in mm of hg $p_v = (p_{vs})_{wbt} - \dfrac{[p_t-(p_{vs})_{wbt}](T_{db}-T_{wb})\times1.8}{[2800-1.3(1.8T_{db}+32)]}$

(OR)

8. Explain winter and year round air conditioning system.

9. A fan pad system of 80% effectiveness is used for supply cool air to a green house. The maximum allowable temperature in the green house is limited to 32^0c. The cooling load is 2940 kj/hr-m^2 of green house floor area. Design DBT and WBT of outdoor air are 35^0c and 16^0c respectively.

   SHF (sensible heat factor) of greenhouse = 0.5

   If the green house is 100 meters long and 80 meters wide, find the air flow and water flow requirements of the system used.

(OR)

10. Define human comfort and explain the factors which affect human comfort.

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

SUBJECT: THERMAL AND NUCLEAR POWER PLANTS

Branch/Specialization: ME/Thermal Engg.

Time: 3 hours   Max. Marks: 60

PART – A

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

1. List different ash handling systems in thermal power station.

2. How gas turbines are classified?

3. What is pressurized water reactor?

4. Enumerate the various types of loads.

5. Write about the classification of pressure measuring device.

PART-B

Answer All questions   **5 x 8 Marks= 40 Marks**

1. a) With the help of a line diagram, explain the working principle and salient points of velox boiler

   b) What is meant by mountings and accessories and explain them briefly with line diagram.

(OR)

2. a) What is meant by steam compounding and why it is needed? Explain one method of compounding with line diagram

   b) With help of a neat diagram, explain the working principle of surface condenser.

3. What is meant by integrated Gasifier combined cycle and explain its working.

(OR)

4. Explain the combined cycle with heat recovery boiler with the help of a neat diagram.

5. a) Explain the working details of nuclear reactor with salient points.

   b) What is meant by enrichment of nuclear fuel? What are the advantages of the same?

(OR)

6. What are the effects of nuclear radiation? Explain briefly. List out different methods used In disposal of nuclear waste.

7. What are the different methods used to meet the variable loads? Explain in details.

(OR)

8. a) What is a load curve? Explain how to plot them.

   b) The maximum demand of a factory is 250 kW and the annual load factor is 50%. This load is to be supplied by a diesel plant costing Rs. 400 per kW and having running cost for fuel and

oil for 6 paise per kWh generated. Rate of interest and depreciation of the diesel engine plant is 10%. The wages of the operating staff per year are Rs. 5000. Calculate the total annual cost of providing this supply.

9. With neat sketches explain about expansion thermometers and pressure thermometers.

(OR)

10. With neat sketches explain about thermo couple thermometers, radiation and optical pyrometers.

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

SUBJECT: <u>SOLAR ENERGY TECHNOLOGY</u>

Branch/Specialization: ME/Thermal Engg.

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

PART – A

Answer All Questions   5 x 4 Marks=20 Marks

1. What is Summer Solstice?

2. What is the function of heliostat in solar tracking?

3. How does an active solar system work?

4. Explain the principle of electricity generation by photovoltaic cells.

5. Explain the parameter affecting the life cycle cost of solar system?

PART-B

Answer All questions   5 x 8 Marks= 40 Marks

1. Explain different types of concentrating collectors with neat sketch.

(OR)

2. Write about various instruments used to measure solar radiation.

3. Explain super critical carbon dioxide power cycle?

(OR)

4. Write about solar power tower with neat sketch?

5. How does a solar pond work?

(OR)

6. Write about various methods of solar energy storage.

7. Write about various types of solar cells?

(OR)

8. Explain the performance analysis of solar cells?

9. Explain the principle of discounted cash flow?

(OR)

10. Explain cost benefit analysis of solar photovoltaic cell?