Uka Tarsadia University (Diwaliba Polytechnic)
Diploma in Computer Engineering
Assignment (Thermal Engineering-1 -020040402)

Unit-1 Two phase system

1. Define wet steam and dry steam?
2. What are the different uses of throttling process?
3. Define two phase system with example.
4. What is the concept of two phase system?
5. Give working principle of throttling calorimeter.
6. What is sensible heat? Write its unit.
7. What is two phase system? Give atleast two examples.
8. What is the degree of superheat?
9. Give importance of mollier chart.
10. Define dryness fraction and state its formula.
11. Give meaning of latent heat of evaporation.
12. Which are the different methods of measuring dryness fraction of steam?
13. What is throttling process?
14. What is the function of calorimeter? Enlist different types of calorimeters.
15. Give equation for enthalpy of (a) dry and saturated steam (b) wet steam.
16. Explain method of determining dryness fraction by seperating calorimeter.
17. Describe formation of steam and its various phases.
18. Find enthalpy and volume of steam having 5 kg steam at 15 bar absolute pressure with 0.85 dryness fraction.
19. Explain throttling process on heat entropy chart.
20. What is throttling? Draw throttling process on P-V, T-S and h-s diagram.
21. Determine volume of 1 kg of superheated steam at pressure of 20 bar absolute and temperature of 300 degree celcius.
22. Explain method of determining dryness fraction by barrel or bucket calorimeter.
23. Describe process of generation of wet steam, dry and saturated steam and super heated steam with the help of T-S diagram.
24. With the help of steam table find values of entropy of water, entropy of evaporation and entropy of dry saturated steam at given pressure 5 bar, 8 bar, 12 bar.
25. Explain entropy is a function of temperature only.
26. Describe mollier diagram and give its importance.
27. Explain method of determining dryness fraction by throttling calorimeter.
28. Determine volume of 1 kg of superheated steam at pressure of 15 bar absolute and temperature of 250 degree celcius.
29. Explain method of determining dryness fraction by combined seperating and throttling calorimeter.
30. Find enthalpy, entropy and volume of 10 kg steam at 12 bar and 0.85 dryness fraction.
31. Describe method of determining dryness fraction by bucket calorimeter.
32. Find enthalpy and volume of steam having 10 kg steam at 12 bar absolute pressure with 0.90 dryness fraction.
33. Explain throttling process on heat-entropy chart.

34. 1 kg steam is heated from 10 bar absolute pressure and 0.8 dryness fraction to superheated with 50 degree celcius of superheat at constant pressure. Find out change in enthalpy.
35. Explain method of determining dryness fraction by seperating calorimeter.

Unit-2 Boilers, Mountings and Accessories

1. List the requirement of good boiler
2. Differentiate the forced circulation boiler and natural circulation boiler.
3. Define boiler. What is the pressure range in high pressure boiler?
4. What are factors should be considered while selecting boiler?
5. Draw spring laded safety valve.
6. Define high pressure boiler and list out the names of it.
7. Write the name of boiler mounting and accessories.
8. Draw figure of an Air preheater.
15. Give classification of steam turbine according to steam reaction, steam flow and steam pressure.
16. Differentiate between natural draft and artificial draft.
17. Write the advantages of draft.
18. Define natural draft and artificial draft?
19. Explain boiler efficiency.
20. Draw Cochran boiler with neat Sketch.
21. Draw Babcock and Wilcox boiler with neat Sketch.
22. Differentiate between fire tube boiler and water tube boiler
23. Differentiate between boiler mountings and boiler accessories.
24. Which are the factors affecting natural draft?
25. Give applications of Boiler in detail.
26. Give classification of Boiler.
27. Explain working of Babcock and Wilcox.(Figure not needed)
28. Explain following Terminology of boiler.
    (a) Shell (b) Grate (c) Blowing off
29. Draw neat sketch figure of water level indicator.
30. Draw neat sketch dead weight safety valve.
31. Draw neat sketch Blow off cock.
32. Explain working of fusible plug.
33. Explain Maintenance of boiler.
34. Give examples of different criteria used to classify boilers.
35. Write a short note on Inspection of boiler.
36. Write a short note on Cochran boiler.
37. Draw neat sketch of Loeffler boiler.
38. Give short note on steam turbine.
39. Give short note ongas turbine.
40. Explain equivalent evaporation of boiler.

Unit-3 Steam prime movers

1. What is energy? Which are the forms of energy?
2. State the functions of steam nozzle.
3. What is compounding of impulse turbine?
4. What are the applications of steam nozzles?
5. Classify steam prime movers.
6. Why compounding of steam turbine is required?
7. Classify steam nozzles. Draw a neat sketch of convergent nozzle.
8. What are applications of steam turbines?
9. What is prime mover? Give its complete list.
10. What is energy? State unit of energy.
11. State the main elements of impulse turbine.
12. What are the applications of steam nozzles?
13. What are the advantages of impulse turbine?
14. Draw a neat sketch of divergent nozzle.
15. What do you mean by compounding?
16. What is the main difference between steam engine and steam turbine?
17. Discuss the types of energy.
18. Explain the velocity compounding of impulse turbine.
19. Differentiate between steam engine and steam turbine.
20. Give the comparison between impulse turbine and reaction turbine.
21. Differentiate between steam engine and steam turbine. Write at least six points.
22. Explain the pressure compounding of impulse turbine.
23. Derive the equation of nozzle efficiency.
24. Apply SFEE to nozzle and derive equation of extreme velocity.
25. Explain pressure-velocity compounding of impulse turbine.
26. Describe about divergent nozzle and draw its neat sketch.
27. State the advantages and disadvantages of pressure compounding.
28. Write a short note on impulse turbine.
29. Differentiate between impulse turbine and reaction turbine.
30. State the advantages and disadvantages of pressure-velocity Compounding.
31. Determine the nozzle efficiency and state its equation.
32. What is the full form of SFEE? Apply SFEE to nozzle.
33. Classify steam turbines.
34. Write a short note on reaction turbine.
35. State the function of steam nozzle. Show on T-s and h-s diagram, when expansion taking place in nozzle with and without friction.
36. Explain the following types of energy: (i) potential energy, (ii) kinetic energy and (iii) internal energy.

Unit-4 Steam condensers and Cooling towers

1. Draw neat sketch of surface condenser. State its advantages.
2. What do you mean by boiler feed water pump?
3. Give difference between parallel and counter flow Jet condenser.
4. Draw a neat diagram of surface condenser.
5. Write down the disadvantages of jet condenser.
6. What is condenser efficiency?
7. Explain in brief about feed water pump.
8. Give merits of natural draught cooling tower.
9. Differentiate Jet condenser and Surface condenser.
10. Compare parallel and counter flow Jet condenser.
11. Draw neat sketch of cooling tower.
12. State the limitations of jet condensers.
13. State the merits of jet condensers.
14. Compare between Jet condenser and Surface condenser.
15. Give disadvantages of natural draught cooling tower.
16. Write a note on jet condenser.
17. Give classification and purpose of cooling towers.
18. Explain surface condenser in detail.
19. Draw and describe briefly about induced draught cooling tower.
20. Give brief idea about jet condenser.
21. Classify surface condenser and explain in detail.
22. Draw and describe briefly about natural draught cooling tower
23. Explain counter flow induced draught cooling tower.
24. Write a note on surface condenser.
25. Explain natural draught cooling tower
26. Explain the effect of air leakage in condenser.
27. Explain parallel flow jet condenser.
28. Explain the effect of air leakage in condenser.
29. Give brief idea about surface condenser.
30. Explain counter flow jet condenser.
31. Describe different types of cooling towers.
32. Differentiate between natural and mechanical draft tower.
33. State primary and secondary functions of a condenser in a steam power plant.
34. Classify cooling towers.
35. What are the sources of air leakage in condenser?

Unit-5 Air compressor

1. Difference between reciprocating and rotary compressors.
2. State applications of air compressors.
3. Explain the effect of clearance on reciprocating compressor.
4. State the functions of important parts of single stage reciprocating compressor.
5. Difference between positive displacement and dynamic compressors.
6. Name different component of centrifugal compressor and explain function of each.
7. What is cavitation? Explain in brief.
8. Difference between rotary and reciprocating compressors.
9. Give examples of industrial and commercial uses of compressors.
10. Explain following terms :
    1. Compression ratio
    2. Volumetric efficiency
    3. Clearance ratio
11. What is clearance volume? Why small clearance is required?
12. Explain cavitation process.
13. What is volumetric clearance? Why clearance is needed in reciprocating compressor?
14. Explain working of single stage air compressor with neat diagram.
15. What do you mean by Centrifugal compressor? Explain in brief.
16. A single stage single acting air compressor is having diameter of 320 mm and 430 mm stroke. It runs at 150 R.P.M. Air at 1 bar and 20^{o}C is taken into the compressor at entry. This air is compressed to 5 bar pressure. Calculate: (1) Mean effective pressure (2) Power required when compression is (a) Isothermal (b) Adiabatic. Also calculate isothermal efficiency. Take R = 287 J/kg K. Neglect clearance.
17. Explain screw compressor with neat diagram.
18. Write note on working of single stage air compressor with neat diagram.
19. State working of Centrifugal compressor with appropriate diagram.
20. Explain positive displacement compressors.
21. What do you mean by single stage air compressor? Explain in brief.
22. Briefly describe working of Centrifugal compressor with neat diagram.
23. For a single acting compressor having its bore and stroke are 130mm and 190mm respectively. Air enters the compressor at 1bar pressure and 20^{o}C. Air is compressed to 6 bar according to law $PV^{1.3}$= C. The compressor is rotating at 110 rpm. Calculate isothermal work done. Take R= 287 J/kg K. Assume no clearance.
24. Briefly describe working of single stage air compressor with neat diagram.
25. Write note on working of Centrifugal compressor with neat diagram.
26. Explain Vane type compressor with appropriate diagram.
27. State working of single stage air compressor with appropriate diagram.
28. Explain working of Centrifugal compressor with neat diagram.
29. Classify compressors and explain one in detail.
30. Explain following terms :
    1. Compression ratio
    2. Volumetric efficiency
    3. Clearance ratio

Unit-6 Heat transfer

1. Write down Fourier's Law of Conduction.
2. Explain Thermal resistance.
3. For same heat transfer rate, which arrangement out of parallel or counter flow will produce compact heat exchanger? Justify your answer.
4. Draw temperature diagram for evaporator and condenser during heat transfer process.
5. Give the value of transmissivity of opaque body and transparent body.
6. Define Convective heat transfer coefficient.
7. Give physical significant of Thermal Conductivity.
8. Differentiate between Free Convection and Force Convection.
9. Explain Recuperator type heat exchanger.
10. Draw temperature diagram for counter flow heat exchanger and parallel flow heat exchanger during heat transfer process.
11. What is black body? Give the value of transmissivity of opaque body and transparent body.
12. Define Thermal conductivity.
13. Differentiate Conduction and Convection process.
14. Give comparison between Parallel Flow/Counter Flow/Cross Flow Heat Exchanger
15. Out of natural and forced convection process which one has higher value of heat transfer coefficient? Justify your answer.
16. Give assumption on which Fourier's law is based.
17. State Stefan Boltzmann law
18. For same heat transfer rate, counter flow arrangement requires lower heat exchange area than required for parallel flow arrangement. Justify the statement with necessary diagram.
19. An oil cooler for a lubrication system has to cool 1000kg/h of oil (Cp=2.09 kJ/kg^{o}C) from 80^{o}C to 40^{o}C by using a cooling water flow of 1000 kg/h at 30^{o}C. Give your choice for a parallel flow or counter flow heat exchanger, with reasons. Calculate the surface area of the heat exchanger, if overall heat transfer coefficient if 24 W/m2^{o}C. Take Cp of water = 4.18 kJ/kg^{o}C.
20. Derive equation of heat transfer through a plane wall.
21. Explain absorptivity, reflectivity and transmissivity
22. Give classification of heat exchanger with examples.
23. A counter flow double pipe heat exchanger using superheated steam is used to hot water at the rate of 10500 kg/h. The steam enters the heat exchanger at 180^{o}C and leaves at 130^{o}C. The inlet and exit temperatures of water are 30^{o}C and 80^{o}C respectively. If the overall heat transfer coefficient from steam to water is 814 W/m^{2o}C, calculate the heat transfer area. What would be the increase in area if the fluid were parallel?
24. Explain heat transfer through a plain wall.
25. Explain different mode of heat transfer.
26. Classify heat exchangers and explain one in detail.
27. The flow rates of hot and cold water streams running through a parallel flow heat exchangers are 0.2 kg/s and 0.5 kg/s respectively. The inlet temperature on the hot and cold sides are 75^{o}C and 20^{o}C respectively. The exit temperature of hot water is 45^{o}C,If the individual heat transfer coefficients on the both sides are 650 W/m$^{2\,o}$**C**, calculate the area of the heat exchangers.
28. Derive Overall heat transfer coefficient for composite material.
29. Explain Convection phenomenon with Newton's law of convection.
30. Explain shell and tube type heat exchanger with examples.
31. State different modes of heat transfer with examples.
32. Explain natural and forced convection.
33. State different types of heat exchanger and explain any one.
34. Derive LMTD for parallel flow heat exchanger.