**UNIT-I**

1. Explain with the help of neat diagrams a regenerative cycle. Derive an expression for its thermal efficiency.
2. In a regenerative cycle the inlet conditions are 40 bar and 4000C steam is bled at 10bar in regenerative heating. The exit pressure is 0.8bar neglecting pump work determine the efficiency of the cycle.
3. Describe the different processes of rankine cycle. Derive the expression for its efficiency and show then on p-v and T-s diagrams.
4. A simple rankine cycle works between pressure of 30bar and 0.04bar the intial condition of steam being dry saturated calculate the cycle efficiency, work ratio and specific steam consumption.
5. Explain with the help of neat diagrams of a carnot cycle. Derive the expression for its efficiency and show p-v and T-s diagrams.
6. In a reheating rankine cycle steam is supplied to a turbine at 6MN/m2 and a temperature of 4500C. It is expanded in the first stage to a pressure of 1 MN/m2. The steam is then passed back to the boiler in which it is reheated of 1 MN/m2 to 3700C. It is then passed to the turbine to be expanded in the second stage down to a pressure of 0.2 MN/m2. The steam is again reheated to 3200C at this pressure. It is send to turbine for the last stage expansion to a condenser pressure of 0.02 MN/m2. Using enthalpy – entropy chart for steam determine (i) The total theoretical power produced per kg of steam (ii)The thermal efficiency of the cycle, considering pump work (iii) The thermal efficiency of the cycle assuming single stage expansion with no reheat and considering pump work.

**UNIT-II**

1. .What is a steam boiler? How they are classified?
2. Explain the construction and working of a Benson boiler with the help of suitable sketches.
3. What are the differentiating features between a water tube and fire tube boilers?
4. Briefly explain the boiler mountings and accessories with any one example to each.
5. Describe with a neat line sketch of a Lamont boiler.
6. A coal fired boiler plant consumes 400Kg of coal per hour. The boiler evaporates 3200 kg of water at 44.50C in to super heated steam at a pressure of 12 bar and 274.50C. If the calorific value of fuel is 32760 KJ/Kg of coal. Determine (i) Equivalent evaporation from and at 1000C and (ii) Thermal efficiency of the boiler. Assume specific heat of superheated steam as 2.1 KJ/KgK.

**UNIT-III**

1. State the function of nozzle and explain different types of Nozzles?
2. The following data were obtained from the test of a surface condenser, condenser vacuum=711 mm of Hg, Hot well temperature=320C, Inlet temperature of circulated water=120C, Outlet temperature of circulated water=280C, Barometer reading=760 mm of Hg. Compute the Vacuum efficiency and the efficiency of the condenser.
3. State the function of steam condenser and define the following terms. (i) Condenser Efficiency (ii) Vacuum Efficiency.
4. Derive an equation for maximum steam discharge through a Nozzle at critical pressure ratio.
5. In a convergent-divergent nozzle the steam enters at a 15bar and 3000C leaves at a pressure of 2 bar. The initial velocity to the nozzle is 150m/sec. Find the required throat and exit area for mass flowrate of 1kg/sec. Assume nozzle efficiency to be 90% and Cp=2.4KJ/KgK.
6. What are the differentiating features between a Jet Condensers and Surface Condensers?

**UNIT-IV**

1. Define the following terms (a) Blade Efficiency (b) Nozzle Efficiency.
2. The velocity of steam leaving the nozzle of an impulse turbine is 1200m/s and the nozzle angle is 200. The blade velocity is 375m/s and the blade velocity coefficient is 0.75. Assuming no loss due to shock at inlet. Calculate for a mass flow of 0.5 kg/sec and symmetrical blade. Find (i) Blade inlet angle (ii) Driving force on the wheel (iii) Axial thrust on the wheel (iv) Power developed by the turbine.
3. In a reaction turbine the blade tips are inclined at 350and 200 in the direction of motion. The guide blades are of same shape as the moving blades but reversed in direction. At a certain place in turbine the drum diameter is 1meter and the blades are 20cm high at this place the steam has a pressure of 1.75bar and dryness 0.935 if the speed of this turbine is 250rpm and the steam passes through the blades without shock. Find the mass of steam flow and power developed in the ring of moving blades.
4. Distinguish between impulse and reaction turbine..
5. In a De-laval turbine steam issues from the nozzle with a velocity of 1200m/s. The nozzle angle is 200, the mean blade velocity is 400m/s, and the inlet and outlet angles of blades are equal. The mass of steam flowing through the turbine per hour is 1000kg. Calculate (i)Blade angles (ii)Relative velocity of steam entering the blades (iii) Tangential force on the blades (iv) Power developed (v) Blade efficiency

**UNIT-V**

1. Classify the various types of air compressors.
2. A single stage double acting air compressor of 150KW power takes air in at 16 bar & delivers at 6 bar. The compression follows the law PV1.35 = C. the compressor runs at 160rpm with average piston speed of 150 m/min. Determine the size of the cylinder.
3. Define the mechanical efficiency and isothermal efficiency of a reciprocating air compressor.
4. In a two stage air compressor in which inter cooling is perfect, prove that the work done in compression is a minimum when the pressure in the intercooler is the geometric mean between the initial and final pressures. Draw the indicator diagram for two stage compression.
5. two stages, single acting air compressor compresses air to 20bar. The air enters the L.P cylinder at 1bar and 27oc and leaves it at 4.7bar. The air enters the H.P. cylinder at 4.5bar and 27oc. the size of the L.P cylinder is 400mm diameter and 500mm stroke. The clearance volume In both cylinder is 4% of the respective stroke volume. The compressor runs at 200rpm, taking index of compression and expansion in the two cylinders as 1.3, estimate 1. The indicated power required to run the compressor; and 2. The heat rejected in the intercooler per minute.

**UNIT-VI**

1. Explain combined velocity diagram with a neat sketch the working of a centrifugal compressor and obtain an expression for the work done.
2. What is the difference between rotary and reciprocating compressor?
3. A centrifugal compressor delivers 50kg of air per minute at a pressure of 2bar and 970C. The intake pressure and temperature of the air is 1 bar and 150C. If no heat is lost to the surrounding, find (a)index of compression and (b) power required if the compression is isothermal Take R=287J/kgK.
4. Explain with a neat sketch the working of an axial flow compressor.
5. Difference between centrifugal compressor and axial flow compressor.