Uka Tarsadia University (Diwaliba Polytechnic)
Diploma in Mechanical Engineering
Assignment (Power Plant Engineering - 020020611)

Unit-1

Introduction to power plant engineering, steam power plant cycles

1. What is captive power plant? State examples.
2. List out different types of power plants.
3. Define: (1) thermal efficiency, (2) specific steam consumption.
4. Write the applications of thermal power plant.
5. Why thermal power plant is more preferable than gas power plant?
6. Draw P-V and T-S diagram of Carnot cycle.
7. Explain the working of thermal power plant in brief.
8. Enlist fuels used in Gas turbine power plant, Diesel power plant.
9. State methods of improving Rankine cycle efficiency.
10. What are the objectives behind study of power plant engineering?
11. Which power plant is best suited for process industries? Why?
12. Write the applications of captive power plant.
13. Draw neat sketch of Brayton cycle and explain in brief.
14. Explain the scope of thermal power plant in India.
15. Enlist basic elements of Diesel power plant.
16. What is reheat cycle?
17. Define work ratio.
18. Explain importance of captive power plant.
19. Which factors affect the performance of Carnot cycle? How?
20. Explain scope of gas power plant in India.
21. Distinguish between thermal power plant and gas power plant.
22. Write equation of efficiency for Brayton cycle and Rankine cycle.
23. Why power plant is necessary in industries?
24. What is regeneration cycle?
25. Enlist the factors affecting thermal power plant efficiency. Explain any three.
26. Which are the processes that comprises Carnot cycle? Show it on P-V diagram.
27. Write a short note on Diesel power plant.
28. Why modification in existing power generation system is required? Explain in brief.
29. Explain Regenerative cycle.
30. Write the effect of reheat cycle on gas turbine plant.
31. Enlist the sources of energy for generation of power.

32. Enlist parameters affecting power cycles and explain any two.
33. Give classification of different fuels.
34. List out different power plants of India with their location.
35. Explain methods for improving efficiency of Rankine cycle.

Unit-2 Steam generating unit, prime movers

1. Define degree of reaction in steam turbine.
2. Explain briefly about Benson boiler.
3. The following data refer to a simple steam power plant

Sr.no.	Location	Pressure	Quality/Temp.	Velocity
1.	Inlet to turbine	14 MPa	380 °C	-
2.	Exit from Turbine and Inlet to Condenser	11 kPa	0.8	300 m/s
3.	Exit from Condenser and Inlet to Pump	10 kPa	Saturated liquid	-
4.	Exit from Pump and Inlet to Boiler	9 MPa	-	-
5.	Exit from Boiler and Rate of steam flow 10000 kg/h	9.5 MPa	420 °C	-

Calculate: (i) Power output of turbine.

(ii) Heat transfer per hour in the boiler and condenser.

4. Give classification of steam turbine.
5. Explain briefly nozzle control governing.
6. What is the importance of governing in turbine?
7. Draw neat sketch of modern steam power plant with all elements.
8. Write the functions of boiler and condenser.
9. Write the functions of super heater and preheater.
10. State Pulverized Fuel System.
11. Which conditions make a boiler to be a high pressure boiler?
12. Explain Lamont boiler with neat sketch.
13. What is compounding of steam turbine?
14. Write in brief throttle control governing.
15. State and explain various circuits of modern thermal power plant.
16. Which systems are used for governing of steam turbine?
17. Distinguish between throttle governing and nozzle control governing.
18. List out boiler furnaces and explain any one of it.
19. What is carry over co-efficient?
20. Explain Schmidt Hartman boiler with neat sketch.
21. Enlist different pre-draft systems used in boiler.
22. Consider a steam power plant that operates on a simple ideal Rankine cycle and has a net power output of 44MW. Steam enters the turbine at 8 MPa and 600°C and is cooled in the condenser at a pressure of 10 kPa by running cooling water from a lake through the tubes of the condenser at

a rate of 1500 kg/s. Show the cycle on a T-s diagram with respect to saturation lines, and determine, (a) the mass flow rate of the steam, and (b) the temperature rise of the cooling water.

23. Differentiate between steam turbine and steam engine.
24. Write briefly about Loffler boiler.
25. The following data refer to a simple steam power plant:

Sr.no.	Location	Pressure	Quality/Temp.	Velocity
1.	Inlet to turbine	9 MPa	350 °C	-
2.	Exit from Turbine and Inlet to Condenser	10 kPa	0.9	200 m/s
3.	Exit from Condenser and Inlet to Pump	8 kPa	Saturated liquid	-
4.	Exit from Pump and Inlet to Boiler	7 MPa	-	-
5.	Exit from Boiler and Rate of steam flow 10000 kg/h	9.5 MPa	430 °C	-

Calculate: (i) Heat transfer per hour in the boiler and condenser.

(ii) Power output of turbine.

26. Explain the principle and operation of steam turbine.
27. What is the effect of inlet temperature and pressure on Rankine efficiency?
28. List out all elements of steam power plant.
29. Consider a steam power plant that operates on a simple ideal Rankine cycle and has a net power output of 45MW. Steam enters the turbine at 7 MPa and 500°C and is cooled in the condenser at a pressure of 10 kPa by running cooling water from a lake through the tubes of the condenser at a rate of 2000 kg/s. Show the cycle on a T-s diagram with respect to saturation lines, and determine (a) the thermal efficiency of the cycle, (b) the mass flow rate of the steam.
30. Explain starting and stopping procedure of steam turbine.
31. Explain the working of Lamont boiler with neat sketch.
32. Why performance analysis of steam turbine is required?
33. Explain by-pass governing of steam turbine with neat sketch.
34. What is stage efficiency?

Unit-3

Steam condensers and cooling towers, steam power station controls

1. What are the functions of steam condenser?
2. State various control parameters and instruments used in modern station control room.
3. Explain evaporative cooling.
4. Write a short note on cooling tower.
5. Give applications of cooling tower.
6. Which parameters are used to measure the performance of condenser?
7. Explain centralized control system in modern power station.
8. What is load factor?
9. Explain heat load for cooling tower.
10. Explain feed water control system in thermal power plant.
11. Draw neat sketch of simple surface condenser.
12. Write briefly about cooling ponds.
13. Give classification of cooling tower.
14. Explain working principle of steam condenser.
15. What are the effects of load variations on steam power plant?
16. Why cooling tower is used in power plant?
17. What is meant by effectiveness of cooling tower? State its unit.
18. Why various records are required to be maintained in steam power plant?
19. What is meant by range of cooling tower?
20. List out different control system of power station and explain one of them.
21. State Basic elements and requirement of control system.
22. Draw neat sketch of induced draft counter flow water-fill tower.
23. Which is the best feed water control system in modern power station? Explain it.
24. Write advantages and disadvantages of cooling tower.
25. Enlist the parameters of performance of condenser.
26. What are the basic elements and requirements of control system?
27. Explain induced draft cooling tower with neat sketch.
28. Explain briefly about surface condenser.
29. Explain hyperbolic cooling tower with neat sketch.
30. Classify different types of condenser and explain any one in detail.
31. What are the components of cooling tower? Explain any two.
32. What is the importance of condensate pump in condenser?
33. Explain about installed capacity of power plant.
34. Explain working of cooling tower with neat sketch.
35. Differentiate between water cooled and air cooled condenser.

Unit-4 Diesel engine power plant and gas turbine power plant

1. State essential elements of diesel power plant.
2. Give classifications of different power plant.
3. State the application of gas turbine plant.
4. Explain construction and working of diesel power plant with diagram.
5. Explain air intake system of a diesel power plant with sketch.
6. Describe different methods for improving performance of gas turbine plants.
7. In an air-standard regenerative gas turbine cycle the pressure ratio is 4.5. Air enters the compressor at 1 bar, 300K and leaves at 490 K. The maximum temperature in the cycle is 1000K. Calculate the cycle, given that the efficiency of the refrigerator and the adiabatic efficiency of the turbine are each 80%. Assume for air, the ratio of specific heat is 1.4.
8. State applications of I.C engine.
9. Enlist the elements of gas power plants.
10. Give advantages of diesel power plant.
11. Explain lubrication system used in diesel power plant.
12. Explain exhaust system of a diesel power plant with sketch.
13. Explain regeneration technique for improving gas turbine performance.
14. In an air-standard regenerative gas turbine cycle the pressure ratio is 5. Air enters the compressor at 1 bar, 290K and leaves at 510 K. The maximum temperature in the cycle is 1000K. Calculate the cycle, given that the efficiency of the refrigerator and the adiabatic efficiency of the turbine are each 80%. Assume for air, the ratio of specific heat is 1.4.
15. Draw T-S diagram for open Brayton cycle of gas turbine plant.
16. Enlist two types of power plant which can be used in peak load conditions.
17. Give the applications of diesel power plant.
18. Explain turbine blade cooling methods.
19. Draw a line diagram of a diesel power plant and state the functions of different systems.
20. Explain air cooling as related to diesel power plant with sketch.
21. In an air-standard regenerative gas turbine cycle the pressure ratio is 3.5. Air enters the compressor at 1 bar, 310K and leaves at 510 K. The maximum temperature in the cycle is 800K. Calculate the cycle, given that the efficiency of the refrigerator and the adiabatic efficiency of the turbine are each 80%. Assume for air, the ratio of specific heat is 1.4.
22. State essential auxiliaries of gas turbine power plant
23. Explain knocking in diesel power plant.
24. Compare gas turbine plant and diesel power plant.
25. Explain lubrication system for diesel power plant with sketch.
26. Explain fuel injection system for diesel power plant with simple diagram.
27. Describe Brayton cycle with P-V diagram in brief.
28. A gas turbine unit has a pressure ratio of 5:1 and maximum cycle temperature of 710^{o}C. The isentropic efficiencies of the compressor and turbine are 0.80 and 0.82 respectively.

Calculate the power output in kilowatt of an electric generator geared to turbine when the air enters the compressor at 15°C at rate of 16 kg/s. Take C_p= 1.005 kJ/kg K and γ=1.4 for compression process and take C_p=1.11kJ/kg K and γ=1.333 for the expansion process.

29. State various components of gas turbine plant.
30. Discuss the phenomenon of knocking in diesel power plant.
31. State advantages of gas turbine over diesel engine.
32. Explain governing system of gas turbine power plant.
33. Explain various types of engine starting system for diesel power plant.
34. Explain water cooling system used in diesel power plant.
35. A gas turbine unit has a pressure ratio of 6:1 and maximum cycle temperature of 610°C. The isentropic efficiencies of the compressor and turbine are 0.80 and 0.82 respectively. Calculate the power output in kilowatt of an electric generator geared to turbine when the air enters the compressor at 15°C at rate of 16 kg/s. Take C_p= 1.005 kJ/kg K and γ=1.4 for compression process and take C_p=1.11kJ/kg K and γ=1.333 for the expansion process.

Unit-5

Nuclear power plant and Hydro power plant

1. Name two major fuels used in nuclear power plant.
2. Describe hazards of nuclear radiation.
3. Describe merits of nuclear plant over other power plants.
4. Explain construction and working of nuclear power plant with diagram.
5. Describe pressurized water reactor with sketch.
6. Name major hydroelectric power plants in India.
7. Name two major hydropower plant projects in India.
8. Give names of turbines used in hydroelectric power plants.
9. Write a short note on Kaplan turbine.
10. Write advantages of nuclear plant over other power plants.
11. Write short note on hazardous effect of nuclear radiation.
12. Classify and explain working of hydro-electric power plant with diagram.
13. Explain CANDU type nuclear reactor with sketch.
14. Discuss the various factors to be considered for selection of site for a nuclear power plant.
15. State two disadvantages of nuclear power plant.
16. Compare between nuclear and steam power plant
17. Give the function of control rods in nuclear reactor
18. Name and explain the basic component of nuclear power plant.
19. Write a short note on nuclear fuels.
20. Compare nuclear and hydropower plant.
21. Write construction and working of heavy water nuclear reactor with sketch.
22. Draw neat diagram of nuclear reactor and explain each component.
23. Write a short note on Pelton wheel turbine.
24. Give two factors to be considered for selecting hydraulic turbines.
25. What is governing of water turbines? Discuss briefly methods used in the governing of pelton turbines.
26. Write a brief note on status and prospects of nuclear power plants in India.
27. State and explain the factors to be considered while selecting the site for hydro-electric power plants.
28. State advantages of hydro power plant over other power plants.
29. Explain nuclear fission and chain reaction.
30. Describe the environmental effects of hydroelectric power plant.
31. Give the function of moderator in nuclear reactor.
32. Name turbines used in hydroelectric power plants.
33. Explain in detail nuclear waste and it disposal.
34. State and explain various turbines used in hydro-electric power plant.

Unit-6

Power plant economics

1. State whether cost of turbines comes under capital cost or working capital cost?
2. Name the power plants which has no fuel costing.
3. Define project cost of power plant.
4. Which is cheapest power plant from the view of capital cost?
5. Which type power plant could be more economic if it runs for longer time?
6. Out of diesel and nuclear power plant, which plant require less cost on fuels?
7. Discuss the expenses incurred in establishing hydroelectric power plant.
8. Define transportation cost.
9. Which type power plant needs highest initial capital investment?
10. Which type of power plant requires less costing on fuels?
11. Which type power plant could be economic if it needs to be run for long time?
12. Out of hydro and thermal power plant, which plant require less costing on fuels?
13. Define material cost.
14. Describe major expenses for setting up nuclear power plant.
15. Explain the costing of power plant in details.
16. Name different power plants and describe the most economic power plant.
17. Out of thermal and nuclear power plant, which could be more advantages in long run from economic point of view?
18. Discuss the selection criteria of power plant based on costing.
19. State whether cost of transportation comes under capital cost or working capital cost?
20. Name the power plants which has zero fuel costing.
21. Explain the major expenses incurred in establishing thermal power plant.
22. How to calculate the project cost of power plant? Explain.
23. Explain selection criteria for power plant.
24. Briefly explain the working capital cost of project.
25. Discuss the expenses can be considered in working capital cost of project.
26. Describe costing of power plant in brief.
27. Explain selection criteria for power plant based on costing.
28. Classify power plants and describe the most economic power plant.
29. Discuss the details of costing for coal based thermal power plant.
30. Describe selection criteria of power plant based on costing.
31. Discuss expenses which come under capital cost of project.
32. Discuss factors to be considered for selection of power plant based on costing.
33. State major expenses incurred in establishing hydroelectric power plant.
34. Describe costing of power plant in brief.
35. Discuss the selection criteria of power plant based on costing.
36. Write a short note on capital cost of project.
37. Describe major expenses for setting up nuclear power plant.
38. Explain the costing of power plant in details.
39. Name different power plants and describe the most economic power plant.