

VALLIAMMAI ENGINEERING COLLEGE
DEPARTMENT OF MECHANICAL ENGINEERING
ME-6701 POWER PLANT ENGINEERING
QUESTION BANK

UNIT-I
COAL BASED THERMAL POWER PLANTS
PART-A

1. Define pinch point? (BT-1)
2. What are two the basic parameters to decide while planning a power plant? (BT-3)
3. What do you understand by the term FBC? (BT-2)
4. On what factors does the unit size of a power plant depend? (BT-2)
5. What is boiler efficiency? (BT-2)
6. Define supercritical steam cycle? (BT-1)
7. What is a back pressure turbine and write any two applications? (BT-6)
8. What is pass-out turbine and when is it used? (BT-1)
9. What are accessories used in a boiler? (BT-1)
10. What do you understand by the term boiler draught? (BT-2)
11. Classify power plants on the basis of traditional use? (BT-3)
12. Draw the P-V, H-S, and T-S diagram for Rankine cycle? (BT-3)
13. What are the processes of Binary cycle? (BT-4)
14. Why is hydrazine injected at the suction of the boiler feed pump? (BT-5)
15. Mention the various modern ash handling system? (BT-4)
16. What are the requirements of a modern surface condenser? (BT-4)
17. List out conventional power plants? (BT-1)
18. List any two advantages of combined cycles? (BT-1)
19. What is the mechanism of pulverized fuel firing system? (BT-5)
20. What is mean by cogeneration system? (BT-1)

PART-B

1. Explain briefly the basic Rankine cycle of a thermal power plant. List out the major components and explain their functions. (16) (BT1)
2. (i) Why reheating is used in some power plants. Explain the modified Rankine cycle. (8) (BT5)
(ii) Draw the complete layout of steam power plant and explain its major components. (8) (BT3)
3. (i) Explain the working principle of FBC with a neat sketch. (8) (BT3)
(ii) Briefly discuss types of FBC? (8) (BT3)
4. (i) Sketch and explain a pressurized FBC system. (8) (BT4)
(ii) Steam enters the high pressure turbine at 12 Mpa and 600°C and is condensed in the condenser at a pressure of 10 kPa. If the moisture content of steam at the exit of low pressure turbine is not to exceed 12 %. Determine pressure at which the steam should be reheated and thermal efficiency of the cycle. (8) (BT6)
5. (i) Explain the unique features of high pressure boilers. (6) (BT4)
(ii) What is the ash handling system? Draw a line diagram of hydraulic ash handling system for modern high capacity plants. Explain its working. (10) (BT3)
6. (i) Explain the principle involved in preparation of coal and what are the methods of preparation. (8) (BT5)
(ii) Distinguish between high pressure boiler and supercritical boiler. (8) (BT2)
7. Explain the various draught system with a neat sketch. (16) (BT3)
8. (i) Explain cogeneration plant efficiency. (8) (BT5)
(ii) What do you understand by cogeneration of power and process heat? Explain its thermodynamic advantage. (8) (BT2)
9. (i) Define binary cycle? Explain the layout and operation of the mercury steam binary cycle power plant? (10) (BT1)
(ii) Define power coefficient? How does it affect the performance of a cogeneration plant? (6) (BT1)
10. (i) How does an industrial steam generator differ from a utility boiler? (8) (BT2)
(ii) Why boiler water is to be treated? Explain briefly feedwater treatment. (8) (BT4)

11. (i) Explain with the help of neat diagram of Evaporative surface condenser and list out its advantages.(8) (BT1)
(ii) Enumerate and explain the steps involved in coal handling.(8) (BT2)
12. Draw a general layout of a thermal power plant and explain the working of various circuits in it.(16) (BT3)
13. Draw and explain in detail about the construction and working principle of cooling towers.(16) (BT4)
14. (i) Briefly explain fuel handling system.(8) (BT5)
(ii) Explain the methods of producing artificial draught.(8) (BT4)

UNIT-II
DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS
PART-A

1. What is a diesel engine? (BT-1)
2. What are the applications of diesel engine power plant? (BT-3)
3. What are the different types of engines used in diesel power plant? (BT-2)
4. Why is power generation by gas turbines attractive these days? (BT-4)
5. What is the duty of the air intake system in a diesel engine power plant? (BT-2)
6. Define break thermal efficiency? (BT-1)
7. What is cycle? What is the difference between an ideal and actual cycle? (BT-2)
8. Draw a P-V and T-S diagram for Otto cycle? (BT-3)
9. Draw the layout of Diesel power plant? (BT-3)
10. Show that the efficiency of the Otto cycle depends only on the compression ratio? (BT-6)
11. State the four processes of the Dual cycle? (BT-1)
12. Define IGCC? (BT-1)
13. Why is the maximum cycle temperature of gas turbine plant much lower than that of diesel power plant? (BT-5)
14. Classify the types of combined cycle plants. (BT-4)
15. What are the advantages of combined cycles? (BT-1)
16. What are the applications of gas turbine? (BT-3)
17. Enlist the advantages and disadvantages of diesel engine power plants? (BT-1)
18. What is the environmental impact of a combined cycle plant? (BT-4)
19. What is integrated gasification combined cycle? (BT-2)
20. Explain the term repowering? (BT-5)

PART-B

1. List and explain the function of the essential components of a diesel power plant. (16) (BT1)
2. (i) With an aid of a block diagram, explain the working principle of a closed cycle gas turbine plant. (10) (BT3)
(ii) Explain how do you select engine for a diesel power plant? (6) (BT4)
3. (i) What are the factors to be considered for selecting the site of a diesel engine power plant? (8) (BT1)
(ii) Describe the different fuels which can be burnt in a turbine plant. (8) (BT2)
4. (i) Explain in detail about Otto cycle and processes with PV and T S diagrams. (8) (BT5)
(ii) Draw a neat sketch of a diesel power plant showing all the systems. (8) (BT1)
5. (i) Write a note on fuel system of diesel power plant. (8) (BT1)
(ii) Explain how reheating improves the efficiency of a simple open cycle gas turbine plant. (8) (BT4)
6. (i) Discuss the effect of pressure ratio on Brayton cycle output and efficiency. (8) (BT2)
(ii) Explain in detail about Dual cycle. (8) (BT5)
7. (i) Discuss the performance characteristics of a gas turbine power plant. (8) (BT2)
(ii) What are the essential features of gas turbine blades? How are blades cooled? (8) (BT5)
8. (i) Discuss the materials which are used for gas turbines and compressors. What properties should the blade material possess? (8) (BT2)
(ii) Explain the effect of regeneration in a gas turbine plant. (8) (BT4)
9. (i) Explain the use of coal in a combined cycle plant. (8) (BT4)
(ii) What is the environmental impact of a combined cycle plant. (8) (BT1)
10. (i) How can a combined cycle plant be used for cogeneration? What is its thermodynamic advantage? (8) (BT4)
(ii) Discuss the advantages of combined cycle power generation. Why is it so important in the present day energy scenario? (8) (BT6)

11. (i) Explain integrated gasification combined cycle with neat sketch. (8) (BT5)
(ii) Explain the drawbacks of a stationary gas turbine power plant for generation of electricity? (8) (BT4)
12. (i) What are the various types of combined cycle plants? What are the inherent advantages of a such a plant? (8) (BT3)
(ii) What do you understand by limited supplementary firing and maximum supplementary firing in a combined cycle plant? (8) (BT2)
13. i) With PV & TS diagram explain the effect of intercooling , reheating in a gas turbine power plant. (10) (BT6)
(ii) What are the merits and demerits of a gas turbine power plant compared to other thermal power plant? (6) (BT5)
14. i) Give the classification of gas turbine power plants. (8) (BT3)
(ii) Bring out the difference between the closed cycle and open cycle gas turbine power plants.. (8) (BT2)

UNIT III
NUCLEAR POWER PLANTS

PART A

1. List out the advantages of nuclear power plant? (BT-1)
2. Compare and contrast between chemical and nuclear reaction. (BT-2)
3. Name the different components of nuclear reactor? (BT-1)
4. Describe a chain reaction? (BT-2)
5. List the requirements to sustain fission process? (BT-1)
6. Describe the function of moderator? (BT-2)
7. List out the desirable properties of a coolant? (BT-1)
8. Explain the function of cladding? What are the criteria for selecting cladding. (BT-4)
9. Generalise the factors those are to be considered for the design of a nuclear power reactor. (BT-6)
10. What do you understand by "Radioactive decay" and "half life"? (BT-2)
11. Define the term "Breeding" (BT-1)
12. Name few types of reactors. (BT-3)
13. Name the coolants commonly used for fast breeder reactors? (BT-3)
14. Explain a BWR? (BT-4)
15. Discuss the factors which control the selection of a particular type of reactor? (BT-2)
16. Name the components of pressurized water reactor nuclear power plant? (BT-4)
17. Explain the function of a pressurizer in a PWR? (BT-5)
18. What is a CANDU type reactor? Explain what is a calandria? (BT-5)
19. Explain a gas cooled reactor? (BT-4)
20. What is meant by breeding ratio? Discuss. (BT-1)

PART B

1. i) Explain the following terms. a. Mass number, b. Atomic number, c. Mass defect, iv. Binding energy. (8) (BT-5)
(ii) Explain fission and fusion reactions with an example. (8) (BT-4)
2. (i) How are nuclear reactors classified? Describe some common types of reactors used for electric power plants. (8) (BT-2)
(ii) Explain the construction and working of Nuclear power plant with a layout. (8) (BT-4)
3. (i) Discuss about a breeder reactor. (8) (BT-2)
(ii) Explain the working of a typical fast breeder nuclear reactor power plant, with neat diagram. (8) (BT-4)
4. (i) What are the difference between a pressurized water reactor nuclear power plant and boiling water reactor nuclear power plant? (8) (BT-4)
(ii) Explain the following terms: (a) Fission of nuclear fuel (b) Distribution of fission energy (c) The chain reaction. (8) (BT-5)
5. (i) List out the advantages and disadvantages of breeder reactor? (8) (BT-1)
(ii) Explain briefly about radiation hazards and shielding? (8) (BT-5)
6. (i) With the help of a sketch show all the important parts of nuclear reactor. Describe briefly the functions of each part. (8) (BT-1)
(ii) Distinguish between controlled and uncontrolled nuclear chain reaction. (8) (BT-2)
7. (i) Explain the working principle of a BWR with a neat sketch. (8) (BT-3)
(ii) Write short notes on pressurised water reactor. (8) (BT-6)
8. (i) Generalize the Safety measures for Nuclear Power plants? (BT-6)
(ii) Write notes on the hazardous effects of nuclear materials.
9. (i) Explain the Gas Cooled Reactor with a neat sketch. (8) (BT-3)
(ii) Explain Liquid Metal Cooled Reactors. (8) (BT-5)
10. (i) Explain the CANada Deuterium- Uranium reactor (CANDU). (10) (BT-4)
(ii) Give the advantages and disadvantages of CANDU Reactor. (6) (BT-2)
11. (i) Explain radioactive decay and half-life of nuclear fuels. (8) (BT-5)
(ii) Write short notes on moderating power and moderating ratio. (8)
12. (i) Explain the types of liquid metal fast breeder reactors. (8) (BT-3)
(ii) Explain with a neat sketch the vapour type pressurizer system. (8) (BT-3)

13. (i) Define a chain reaction? Explain how it is maintained? (8) (BT-1)
(ii) What is the difference between controlled and uncontrolled chain reaction?
Explain with neat sketches and with examples(8). (BT-2)
14. (i) List out the advantages and disadvantages of nuclear power plant? (8) (BT1)
(ii) Explain with a neat sketch the indirect gas cooled reactor. (8) (BT-4)

UNIT 4
POWER FROM RENEWABLE ENERGY

PART A

1. Describe the operating principle of a hydroelectric power plant. (BT-1)
2. What are the main components of a Hydel power plant? (BT-1)
3. What are the factors to be considered while selecting the layout of a Hydel powerplant? (BT-2)
4. Name the methods by which water heads are measured for a layout of Hydel power plants. (BT-1)
5. Describesalt gulp method? (BT-1)
6. Name some typical components of a wind mill. (BT-1)
7. What do you understand by tip-speed ratio? (BT-2)
8. List out the advantages of tidal power plants over Hydel power plant? (BT-1)
9. What are the components of tidal power plant? (BT-4)
10. What do you understand a solar photo voltaic power system? (BT-2)
11. Point out the applications of SPV? (BT-4)
12. Give the significance of solar thermal energy. (BT-2)
13. What is geothermal energy? Mention its applications. (BT-3)
14. Classifythe different types of geothermal fluids? (BT-3)
15. What are the forms of geothermal energy stored deeply inside the earth? (BT-3)
16. Explain the concept of biogas technology? (BT-5)
17. Give some applications of biogas. (BT-2)
18. Explain how a fuelcell works? (BT-4)
19. Name the different types of fuelcells. (BT-2)
20. Explain what is a FCEV? (BT-5)

PART B

1. (i) Draw the general layout of thermal power plant and explain the working of different circuits. (8) (BT3)
(ii) Sketch the layout of hydroelectric power plant and explain the functions of each component in it. List out the advantages and limitations of this plant. (8) (BT1)
2. (i) Explain in detail about surge tank used in hydro electric power plant. Also explain about the classification and selection of dams. (8) (BT4)
(ii) What are the factors to be considered while selecting a site for hydroelectric power plant? (8) (BT3)
3. (i) Explain the selection factors of a hydraulic turbine .What are the function of a hydraulic turbine? (8) (BT4)
(ii) How are the turbines classified? Explain anyone with a suitable sketch. (8) (BT2)
4. (i) Sketch and explain the two pool tidal power plant. (8) (BT2)
(ii) What are the different types of Tidal power plants? (8) (BT2)
5. (i) Explain with a neat diagram of wind electric generating power plant. (8) (BT5)
(ii) Explain in detail about the various types of Wind energy system. (8) (BT3)
6. (i) Write notes on solar thermal power plant. (8) (BT3)
(ii) Explain the Solar thermal central receiver system. (8) (BT5)
7. (i) Write short notes on the types of collectors in a solar power plant. (10) (BT2)
(ii) Enumerate the advantages and disadvantages of concentrating collectors over flat plate collectors. (6) (BT1)
8. (i) Explain the construction and working of Geo thermal power plant. (8) (BT5)
(ii) Discuss the different system used for generating power using geothermal energy. (8) (BT2)
9. Enumerate and explain the various types of prime movers used in geothermal energy conversion systems. (16) (BT4)
10. (i) What is a SPV power plant and Explain in detail how power is produced in a SPV power plant? (8) (BT4)
(ii) List out the advantages and disadvantages of SPV power plant. (8) (BT1)
11. (i) Explain the method of power generation using Biogas. (8) (BT5)
(ii) Write short notes on the types of generators to generate electricity from biogas. (8) (BT3)

12. (i) What is a fuel cell? Explain its working using a block diagram.(8) (BT3)
(ii) Explain the generalised concept of a fuel cell as a power plant.(8) (BT6)
13. (i) Explain the principle , construction and working of a tidal power plant. (8) (BT5)
(ii)Listout the advantages and disadvantages of a tidel power plant.(8)
(BT1)
14. (i) Explain the principle , construction and working of a wind power plant.(8) (BT4)
(ii)Listout the advantages and disadvantages of a wind power plant.(8)
(BT1)

UNIT 5

ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS

PART A

1. Define demand factor. (BT-1)
2. Define load factor. (BT-1)
3. What do you understand by load curve? (BT-2)
4. Draw the load duration curve. (BT-3)
5. What do you understand by tariff? Mention its types. (BT-3)
6. How can we calculate the cost of electricity? (BT-6)
7. How will you describe two part tariff? (BT-2)
8. Discuss how power factor can be improved? (BT-2)
9. Describe the capital cost of power plant? (BT-1)
10. Explain what is financing cost? (BT-4)
11. Explain what is operating cost? (BT-5)
12. Discuss about flat demand rate. (BT-2)
13. Mention the various operating cost of coal fired steam power plant? (BT-3)
14. Describe depreciation. (BT-1)
15. List the waste disposal options for Coal Power Plant? (BT-1)
16. List the components of fixed cost. (BT-1)
17. Compare the significance of two part tariff and three part tariff? (BT-4)
18. Explain the criteria for site selection of power plant? (BT-5)
19. Point out the merits and demerits of site selection of power plant. (BT-4)
20. Point out the waste disposal options for Nuclear Power Plant? (BT-4)

PART-B

1. (i) What do you understand by power plant economics? Discuss.(8) (BT-2)
(ii) Explain the fixed costs and operating costs of a power station. (8) (BT-4)
2. (i) Show the elements which contribute to the cost of the electricity?(8) (BT-3)
(ii) Describe how the cost of power generation be reduced?(8) (BT-1)
3. (i) What do you understand by cost of electrical generation?(8) (BT-2)
(ii) Explain the various types of cost associated with power generation?(8) (BT-4)
4. (i) Write the explanatory notes on the economics of power generation.(8) (BT-4)
(ii) A residential consumer has 10 lamps of 40 W each. His demand is (BT-3)
Midnight to 5 am – 40 W
5am to 6 pm – no load
6 pm to 7 pm – 329 W
7 pm to 9 pm – 360 W
9 pm to midnight – 160 W
Plot the load curve. Calculate the average load, max load and demand factor.(8)
5. (i) What is a tariff? (2)
(ii) Discuss and compare various tariff used in practice.(14) (BT-1)
6. (i) Explain the various methods used to calculate the depreciation cost.(8) (BT-4)
(ii) Elucidate the objectives and requirements to tariff and general for of tariff.(8) (BT-5)
7. (i) Explain the terms peak load, demand factor, load factor and plant use factor.(8) (BT-5)
(ii) What are load curves and load duration curves? Discuss their utility in the economics of generation.(8) (BT-1)

8. A generating stations as a maximum demand (MD) of 15 MW and the daily load curve on the station is as follows,

10pm to 05 am 2500 KW

01pm to 04pm 10000KW

05am to 07 am 3000KW

04pm to 06pm 12000KW

07pm to 11am 9000KW

06 pm to 8pm 15000KW

11am to 01pm 6000KW

08pm to 10pm 5000KW

(BT-6)

Determine the size and the number of generator units, plant load factor, plant capacity factor, use factor and reserve capacity of plant.(16)

9. A power plant has to supply load as follows:

Time(hrs)	0-6	6-12	12-14	14-18	18-24
Load(MW)	45	135	90	150	75

(BT-6)

Draw the load curve, load duration curve and Choose suitable generation units and its operation schedule to supply the load.(16)

10. (i) Explain about economics of load sharing between generators.(8) (BT-4)
(ii) Explain about economics of load sharing between Power Plants.(8) (BT-5)
11. (i) What are the fixed and operating costs of steam power plants?(8)
(ii) Describe how are they accounted for fixing cost of electricity?(8) (BT-1)
12. (i). Explain the pollution control technologies including waste disposal options for coal power plant. (8) (BT-4)
(ii) Explain in detail Capital & Operating Cost of different power plants. (8) (BT-5)
13. Explain the pollution control technologies including waste disposal options for nuclear power plant. (16) (BT-4)
14. (i) Give short notes on site selection criteria.(10) (BT-2)
(ii) Explain the merits and demerits of site selection criteria.(6) (BT-4)