DHANALAKSHMI SRINIVASAN ENGINEERING COLLEGE

DEPARTMENT OF MECHANICAL ENGINEERING

ME1354 POWER PLANT ENGINEERING

QUESTION BANK

UNIT I (INTRODUCTION TO POWER PLANTS & BOILERS)

PART A (2 marks)

1. What is the principle behind Steam power plant?
2. Write different energy conversions in Hydel Power plant.
3. What is combined power cyles?
4. List any two difference between water tube boiler and fire tube boiler
5. What do you mean by High pressure boiler
6. What is the advantage of using fluidized bed in boilers?
7. Name any two examples for high pressure and super critical boilers.
8. What do you mean by Load du ration curve?
9. Give any two advantages of Gas turbine po wer plants?
10. What is Bottoming cycle?
11. What is MHD?
12. List any two advantages of Diesel power plant

PART B (16 marks)

1. Explain the construction and working of Steam power plant with a layout.
2. Explain the construction and working of Hydel power plant with a layout..
3. Explain the construction and working of Diesel power plant with a layout.
4. Explain the construction and working of Nuclear power plant with a layout.
5. Explain the construction and working of Gas turbine power plant with a layout.
6. Explain the construction and working of any one High pressure boiler with a layout.
7. Explain the construction and working of any one Fluidised bed boiler with a layout.

UNIT II (STEAM POWER PLANT)

PART A (2 marks)

1. Name the four major circuits in steam power plant.
2. What consists of air and flue gas circuit?
3. What consists of feed water and steam flow circuit in steam power?
4. What consists of cooling water circuit and coal & ash circuit in steam power plant?
5. Define bleeding in steam power plant?
6. Name different methods used to extract steam for heating the feed water?
7. Define draught, what is the use of drau ght in thermal power plants?
8. Write about classification of draught?
9. What is the function of economizer?
10. List out the different types of wastes heat recovery boilers.

PART B (16 marks)

1. (a) Discuss the relative merits of different out plant coal handling.

(b) Describe the hydraulic ash handling system. [8+8]

2. (a) Why are feed water heaters used?

(b) Explain with a sketch the working of a Barometric condenser? [8+8]

3. (a) what is a ball mill? What are its advantages?

(b) Explain the characteristic features of a ball mill? [8+8]

4. (a) Describe "Zeolite water softenin g p rocess" with a sketch.

(b) Explain the importance of pH value to control corrosion phenomenon.

[8+8]

5. (i) What are the advantages of FBC systems? (4)

(ii) A power plant using stream as working fluid operates on a Rankine cycle.The boiler and condenser pressure are 30 bar and 1 bar.The condition of stream entering the prime -mover is dry and saturated. Find the thermal efficiency of the cycle neglected the feed pump work and considering the feed pump work,. (8)

6. What is the importance of thermal power dev elopment in the country? Describe its development in the last 10 years. [16]

7. (a) What is a cyclon e furnace? Where it is used? Mention its advantages and Disadvantages.

(b) Why is teritary air required in a cyclone furn ace? Where is it admitted?

[8+8]

8. (a) Draw a chart showing operations and devices used in coal handlin g plant.

(b) Describe different types of coal conveyors. [8+8]

UNIT III (NUCLEAR AND HYDEL POWER PLANTS)

PART A (2 marks)

1. What is the main purpose of the reservoir?

2. What is the main purpose of the dam?

3. Wh y trash rack is used?

4. What is the use of surge tank?

5. Explain about penstock?

6. What is the use of spill Ways?

7. What are the requirements to sustain fission process?

8. Define multiplication factor of a fission process.

9. What are the desirable properties of a good moderator?

10. What are the desirable properties o f a coolant?

11. Name few types of reactors

12. What are the adv antages o f breeder reactors?

PART B

1. (a) What is a chain reaction? How it is controlled. [5]

(b) Describe the fast breeder reactor. [6]

(c) What is function of shield? What are the different types of shields? [5]

2. (i) With neat sketch ex plain the boiling water reactor power plant [8]

(ii) What are the advantges and disadvantages of nuclear power plant? [8]

3. (a) What are the advantages and disadvantages of breeder r eactor? [5]

(b) What do you mean by fission of nuclear fuel? [5]

(c) Explain briefly about radiation hazards and shielding? [6]

4. (a) What do you understand by thermal shielding? [4]

(b) What are the functions of a reflector? [4]

(c) Explain the working and characteristic f eatur es of a homogeneous reactor. [8]

5. What are the various factors to be considered in selecting the site for a hyd ro electric power plant an d sicuss about primary and secondary investigations. [16]

6. (a) Explain in detail the spillways, baffle piers and drainage gallery.

(b) Explain the various factors to be considerd in the selection of a hydraulic turbine. [8+8]

7. (a) Explain the terms catchment area, rain fall and run off.

(b) Explain the arran gement of the components of a hydro electric power plant with a neat sketch. [8+8]

UNIT IV (DIESEL AND GAS TURBINE POWER PLANT)

PART A (2 marks)

1. What are the uses of air filter and superchargers in diesel engine power plant? 2. What is the function-of cooling system in Diesel power plant?

3. What consists of lubrication system in diesel engine power plant?

4. Define turbo charging in combined gas turbine and diesel cycles?

5. What is the purpose of intercooler in gas turbin e power plant?

6. Name two combined power cycles?

7. What is the purpose of Regener ator in Gas turbine power plant?

8. List any two difference between open cyle and closed cycle

9. List any two advantages of Diesel power plant

PART B (16 marks)

1. (a) Explain with the help of a block diagram the fuel storage and supply system of diesel power plant.

(b) Explain with the help of a block diagram the water cooling system of diesel power plant. [8+8]

2. (a) Mention the advantages and disadvantages of a diesel power plant over a gas

turbine power plant.

(b) Give a maintenance schedule for Diesel engin e power plant. [8+8]

3. Describe the following systems in brief with respect Diesel Power Plant.

(a) Fuel storage and supply system [5]

(b) Exhaust system [5]

(c) Lubrication system [6]

4. (a) Draw a neat layout of a diesel power plant and label all the components. [10]

(b) List the advantages of diesel power plant s over other thermal power plants.

[6]

5. (a) Explain the cooling system of a Diesel power plant.

(b) What are the different types of engines used in Diesel power plants. [8+8]

6. With a neat sketch explain the working of a simple constant pressure gas turbine. Mention its advantages and disadvantages. [16]

7. (a) With help of a block diagr am ex plain the main components of a open cycle gas turbine power plant.

(b) Give the classification of gas turbine power plants. [8+8]

8. (a) Give the advantages and disadvantages of open cycle gas turbine power plant.

(b) A simple open cycle gas turbine plant works between the pressures of 1 bar and 6 bar and temperatures of 300 K and 1023 K. The calorific value of the fuel used is 42 MJ/kg. Find :

i. airfuel ratio

ii. Thermal efficiency of the plant if the mechanical and generatin g efficiencies are 95% and 97% respectively. Assume air flow = 20 kg/s and compression and expansion are isentropic. [8+8]

UNIT V (OTHER POWER PLANTS AND ECONOMICSS OF POWER PLANTS)

PART A (2 marks)

1. Define load factor?

2. What includes fixed cost?

3. What includes operating cost?

4. What is the need of depreciation cost?

5. What is the working principle of OTEC?

6. What is High tide and Low tide?

7. What is the working principle of solar thermal central receiver system?

8. What are the different types tariffs in Ener gy rates?

9. Name two types of Geo thermal power plants

10. Draw the layout of OTEC

PART B (16 marks)

1. (a) What are the capital cost and fixed cost to be considered for cost an alysis. [6]

(b) A power station has the installed capacity of 120 MW. Calculate the cost of generation, other data pertaining to power station are given [10]

Capital cost = Rs.120 × 106

Rate of interest and d epreciation = 18 %

Annual cost of fuel oil, salaries and taxation = Rs.25 × 106

Load factor = 40 %

2. (a) Explain economics in plant. [5]

(b) What are general arrangement for power distribution. [5]

(c) Estimate the generating cost per unit supplied from a power plant having the following data [6]

Plant capacity = 120 MW.

Capital cost = Rs.600 × 106

Annual load factor = 40 %

Annual cost of fuel, taxation, oil and salaries = Rs.500000

Interest and depreciation = 12 %

3. (a) What is meant by load curve ? Explain its importance in power generation.

(b) A power station has a maximum demand of 80 x 103 kw and daily load curve is defined as follows : [6+10]

Time (Hr) 0-6 6-8 8-12 12-14 14-18 18-22 22-24

Load (MW) 40 50 60 50 70 80 40

Determine the load factor of power station

4. (a) Differentiate between fixed and running charges in the operation of a power

plant. [6]

(b) Determine the gen eration cost Per unit of ener gy fo r power plant from the following data. [10]

Installed capacity = 100 MW

Capital cost of power plant = Rs. 3500 Per KW

Interest and depreciation = 12 %

Fuel consumption = 1 Kg / KWh

Fuel cost = Rs.50 per 1000 Kg.

Salaries wages, repairs and other operating costs per annum = Rs. 10 x 106

Peak load = 100 MW

Load factor = 60%

5. (a) Define:

i. Connected load

ii. Maximum demand

iii. Demand factor [6]

(b) The peak load on a power station is 30 MW. The loads having max imum demands of 25 MW, 10MW, 5 MW and 7 MW are connected to the power station. The capacity of the power station is 40MW and annual load factor is 50 % find.

i. Average load on the power station.

ii. Energy supplied per year.

iii. Demand factor.

iv. Diversity factor. [10]

6. (i) Discuss the boiler inspection and safely regulations.[6]

(ii) A power station has two 60 MW units each runnning for 7000 hours a year and one 30 MW unit running for 1500 hours a year. The energy produced per year is 700 X 10 ^6 kwh. Calculate the plant load factor and plant use factor.[10]

7. Explain the construction and working of Geo thermal power plant