**ME6701-POWER PLANT ENGINEERING**

**UNIT-1**

1. (a)(i)Discuss the various steps involved in coal handling systems. (5) (A/M18)

(ii)Brifely discuss the commonly use ash handling system. (8)(A/M18)

(b)Explain the working and advantages of a fludized bed combustion system.(13)(A/M18)

1. (a)The following data refer to a simple steam power plant

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NO | Location | Pressure bar | Quality/Temp°c | Velocity m/s |
| 1 | Turbine inlet | 60 | 380 | -- |
| 2 | Condenser inlet | 0.1 | 0.90 | 200 |

Calculate

Power output of the turbine

Heat transfer rate in boiler and Condenser

Quantity of cooling water circulated(13) (N/D17)

(b)(i)With a neat diagram explain the function FBC boilers.(6)(N/D17)

(ii) Super critical boilers (7)( N/D 17)

1. (a) Explain the following subsystems of thermal power plant
2. Fuel handling system
3. Ash handling system (16) (A/M17)

(b) (i)Explain any one type of cooling tower with neat sketch (8) (A/M17)

 (ii)Describe with the help of neat sketch working of induced draught cooling tower.(8)(A/M17)

1. (a) Draw general layout of steam power plant with neat diagram and explain the working of different circuits. (16) (N/D16)

(b)Explain the following with neat diagram

 (i)Benson boiler

 (ii) Anyone type of cogeneration plant (16) (N/D16)

1. (a) (i) Describe the working of FBC boiler with a neat diagram (8) (A/M16)

 (ii)Explain the arrangement and operation of a surface condenser (8)(A/M16)

(b) (i) Discuss the function of airheater types (8)(A/M16)

 (ii)Describe with a sketch the working of a mercury-water binary cycle.(8) (A/M16)

1. (a) write short notes on :
2. Ash handling system (8)(N/D15)
3. Different draught systems(8)(N/D15)

 (b) Explain with a neat sketch the working of a thermal electrical power plant station and discuss the function of major components. (16) (N/D15)

 **UNIT-II**

1. (a) Describe the functions and types of fuel injection systems.(13) (A/M18)

(b) (i) write a brief note on starting systems of gas turbine (5) (A/M18)

 (II)With the help of neat diagram, explain the working of combined gas turbine and steam turbine plant (8) (A/M)18

1. (a)(i) Enlist the advantages and disadvantages of a Diesel engine power plant. (6)(N/D17)

 (ii)Compare the merits and demerits of open and closed cycle gas turbine power plant.(7) (N/D17

(b) A 4.5 MW gas turbine generating set operates with two compressor stages . The overall pressure ratio is 9:1 The high pressure turbine drives the compressor and the low pressure turbine drives the generator. The temperature of gases at entry to the HP turbine is 625°C . The exhaust gases leaving the LP turbine are passed through the heat exchanger to heat the air leaving the HP stage compressor.The compressor have equal pressure ratios and intercooling is complete between the stages. The air inlet temp is 20°C. The isentropic efficiency of each compressor stage is 0.8 and that each turbine stage is 0.85.

The heat exchanger thermal ratio 0.8. Assume a mechanical efficiency of 93% for both power shaft and compressor turbine shaft. Neglecting other losses compute

Thermal efficiency, Work ratio of the plant , Mass flow rate (Take Cp=1.0KJ/KgK,√=1.4 for air Cp =1.15 KJ/KgK, √=1.33 for exhaust gases)(13) (N/D17)

1. (a) List the types of gas turbine power plant and explain in detail with neat diagram (16)(A/M17)

(b)Explain in detail about the construction of and working of Integrated Gasification combined cycle.(16) (A/M17)

4. (a) Discuss the essential components of the diesel power plant with neat layout.(16)(N/D16)

(b) (i) Derive an expression for the work ratio using Brayton cycle (8) (N/D16)

 (ii)Discuss the working of any one type of combined cycle power plant (8) (N/D16)

5 (a)(i) With the help of diagram explain the function of essential components of diesel power plant (10) (A/M16)

 (ii)What is IGCC system ? Brief (6) (A/M16)

 (b)(i) Bring out the difference between closed cycle and open cycle gas turbine power plants (8)(A/M16)

 (ii) Discuss why combined cycle power generation is so important in present day energy scenario.(8)(A/M16)

 6 (a) Explain the working of open cycle and closed cycle gas turbine power plant and discuss its advantages and disadvantages(16) (N/D15)

 (b)(i) Explain in detail about the construction and working of IGCC.(10)

 (ii)Draw and explain PV and TS diagram of Brayton cycle.

 **UNIT-III**

1. (a) (i) Write a note on nuclear fuels.(5)(A/M18)

 (ii)Write the points to be considered for selecting sites for nuclear power plant (8)(A/M18)

(b) Explain the woking of a pressurized water reactor with a schematic diagram. (13) (A/M18)

2. (a) Compare the working, merits and demerits of PWR and BWR. (13) (N/D17)

 (b) (i)What is CANDU Type reactor? Explain with a neat sketch its main features.(8)(N/D17)

 (ii) Name the 4 reactions involving Deuterium in a fusion reactor. Which one is achieved quite early? (5) (N/D17)

3.(a) Explain with neat diagram various components of nuclear reactor with layout of power plant. (16) (A/M17)

 (b)(i)With neat diagram explain boiler water reactor also mention its advantages and disadvantages . (8) (A/M17)

 (ii)Explain Nuclear fission and chain reaction(8) (A/M17)

1. (a)(i) Explain CANDU (Canadian –Deuterium –Uranium) reactor with neat diagram also mention merits and demerits (10) (N/D16)

 (ii)Discuss about the safety measures adopted in modern nuclear plants. (6)(N/D16)

(b)Explain the construction and working of nuclear power plant with a layout (16) (N/D16)

1. (a) (i) Explain the functions of reflector and cladding.(8)(A/M16)

 (ii)Explain the necessity of pressurizer in PWR power plant (8) (A/M16)

(b) (i) List and brief the characteristics features of a BWR (8)(A/M16)

 (ii)Write a note on India’s three stage nuclear power programe (8) (A/M16)

1. (a) Explain with a neat diagram the various parts of nuclear power plant and mentioning the function of each part.(16) (N/D15)

(b) (i) Explain CANDU reactor with neat sketch. Give its advantages and disadvantages. (8)(N/D15)

 (ii)Explain what is chain reaction in connection with a nuclear reactor. (8) (N/D15)

**UNIT-IV**

1.(a)(i) Explain briefly the essential features of hydroelectric power plant.(8)(May18)

 (ii) State the advantages of inward flow reaction turbine over outward flow reaction turbine.(5)(may18)

 (b) (i) Explain the operation of a fixed dome type digester biogas plant.(5) (May18)

 (ii) Describe the working of hydrogen-oxygen fuel cell.(8)(May18)

2.(a) “Solar Thermal Power cycles can be broadly classified into Low, Medium and High temperature cycle”.Elaborate this statement with suitable examples and relevant sketches.(Nov17)

 (b) (i) The wind velocity 10 m/s at 22°C. Turbine diameter is 10m. The wind machine operates at 35rpm at a peak efficiency of 40%. Compute the following . Total power density of wind stream, Actual power density, Turbine power output.(Nov17)

 (ii) Describe the energy generation cycle of Single Basin Single effect and Single basin Double Effect system.(Nov 17)

3.(a) With neat diagram explain the working of biogas plant and solar photovoltaic system with advantages and disadvantages.(16) (Apr/May17)

 (b)Explain the layout of hydroelectric power plant with neat diagram. (16) (Apr/May17)

4.(a)(i)Explain the construction and working of fuel cell also mention its merits and demerits.(12)(Nov16)

 (ii) List the advantages and disadvantages of wind energy system.

 (b) Explain the layout of hydroelectric power plant with neat diagram.(16)(Nov16)

5.(a) (i) Write on the factors that should be considered while selecting a site for hydroelectric plant (8) (Apr/May16)

 (ii) What is pumped storage plant? Explain with neat sketch.(8)(Apr/May16)

 (b) (i) Describe the functions of a solar PV electric plant (8)(Apr/May16)

 (ii)Enumerate the advantages of fuel cell power sources with specific reference to environment.(8)(Apr/May16)

6.(a) (i) Draw a schematic diagram of hydro plant and explain the operation.(10)(Nov15)

 (ii) Write short note on bio energy.(6) (Nov15)

 (b) (i) Briefly explain solar PV System.(8) (Nov15)

 (ii) What are the various kinds of fuel cell and explain the working of any one?(8)(Nov15)

 **UNIT-V**

1.(a) (i)What are the basic requirements of energy tariffs?(5) (Apr/May18)

 (ii) Explain the elements of operating expenditure of a power plant.(8)(Apr/May18)

 (b) Determine the thermal efficiency of a steam power plant and its coal bill per annum using the following data:

Maximum demand = 24000KW, Load factor=40%, Boiler efficiency=90%, Turbine efficiency=92% ,Coal consumption =0.87 kg/Unit Price of Coal =Rs.280 per tonne.(13)(Apr/May 18)

1. a) List various pollutants released by the coal based thermal power plants and detail the techniques adopted to mitigate them.(13) (Nov/dec 17)

b) (i) Indicate and discuss any 4 methods adopted for the disposal of radioactive waste materials.(7) (Nov17)

 (ii) Agenerating station supplies four feeders with maximum demands (inMW) 16,10,12 and 7. The overall maximum demand of the station is 20MW and the annual load factor is 45%. Calculate the diversity factor and number of Units generated annually.(6) (Nov17)

1. (a) (i) Mention the objectives and requirements to tariff(8) (Apr/May17)

 (ii)Define demand factor, load factor, diversity factor , reserve factor.(8)(Apr/May17)

(b) Explain the methods to control pollution in thermal and nuclear power plants.(16)(Apr/17)

4. (a) Explain the methods to control pollution in thermal and nuclear power plants.(16)(Nov/Dec16)

 (b)(i) Explain site selection criterion of hydro electric power plant.(8)(Nov/dec16)

 (ii) A peak load on the thermal power plant is 75 MW. The loads having maximum demands of 35MW,20MW,15MW,and 18MW are connected to the power plant. The capacity of the plant is 90MW and annual load factor is 0.53. Calculate the average load on power plant, energy supplied per year, demand factor and diversity factor.(8) (Nov/16)

5.(a) (i)List and discuss any 4 power tariff structure adopted by TANGEDCO?(8)(Apr/May16)

 (ii) Name the pollution control technologies adopted in thermal power plants and describe anyone.(8) (Apr/May16)

 (b) (i) Name and elaborate on the elements that contribute to the total cost of electricity (6) (Apr/May16)

 (ii)Brief: Base load, Peak load and Average load of Thermal power .(6)(Apr/May16)

1. Indicate the likely %cost of capital and operating cost of thermal power plant take the like of the power plant as 25 years.(4)(Apr/May16)

6.(a)(i) Explain the analysis of pollution from thermal power plants.(10)(Nov/dec15)

 (ii)Elucidate the objectives and requirement to tariff and general form of tariff.(6)(Nov/dec15)

 (b)(i) Write a short on nuclear waste disposal .(8)(Nov/dec15)

 (ii) A Central power station has annual factor as follows. Load factor -60%, Capacity factor =40% and use factor =45%. Power station has a maximum demand 15000 KW. Determine the annual energy production, reserve capacity over and above peak load and hours per year not in service.(8)(Nov/dec15)