Code No: **R42039** **R10** **Set No. 1**

IV B.Tech II Semester Regular/Supplementary Examinations, April - 2015

POWER PLANT ENGINEERING

(Mechanical Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1 a) Draw a neat line diagram of inplant coal handling and indicate the functioning of equipment at different stages. [8]

b) With the help of a neat sketch explain the working of hydraulic ash handling system. [7]

2 a) With a neat sketch explain the working of steam power plant. [7]

b) What is the importance of dust collector in a thermal power plant system? Explain the working of a cyclone dust collectors. [8]

3 a) Draw a neat line diagram of a diesel power plant showing all the systems and explain the working. [8]

b) What are the problems encountered in the design of gas turbine combustion chamber/ draw a neat sketch of the combustion chamber used in modern open gas turbine plant. What are the desirable requirements of a good combustion system? [7]

4 a) Explain how hydroelectric power plants are classified. Explain each classification. [6]

b) With a neat sketch explain the working of a hydro electric power plant. [9]

5 a) Discuss the various factors to be considered while selecting the site for nuclear power stations. [6]

b) With a neat sketch explain the working of liquid metal cooled reactor. Write its advantages and disadvantages. [9]

Code No: **R42039** **R10** **Set No. 1**

6 a) Explain the working of storage type hydro electric plant in combination with steam plant. [7]

b) A load duration curve of a system is a straight line, the maximum and minimum loads being 100 MW and 20 MW respectively. The load is supplied by base load and peak load plants. The total cost of both is given as.
For base load plant: Rs. 200/kW-year + 5 P/kWh
For peak load plant: Rs. 50/kW-year + 10 P/kWh
For minimum overall cost, determine the load shared by peak load plant and annual load factor for both stations. [8]

7 a) Explain the magnetic wind method for the measurement of O_2 in the flue gases. [7]

b) Draw the electric line diagram to measure CO_2 in the flue gases and explain the working. [8]

8 a) A power station has an installed capacity of 20 MW. The cost of the plant is Rs. 12000/kW installed. The fixed charges are 13% of the investment. At 100% load factor, the variable cost of the station per year are 15 times the fixed costs. Assuming there is no reserve capacity and variable costs are proportional to the energy production, find the cost of generation at 100%, 80%, 60%, 40% and 20% load factor. [8]

b) Explain the pollution caused due to gas power plant. How it can be controlled. [7]

Code No: **R42039** **R10** **Set No. 2**

IV B.Tech II Semester Regular/Supplementary Examinations, April - 2015

POWER PLANT ENGINEERING

(Mechanical Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1 a) What are the different types of coal conveyors? Indicate the use of each and justify that its use is essential at that stage. [8]

b) What are the requirements of a good ash handling system? Explain the working of any one ash handling system [7]

2 a) Explain the working of electrostatic precipitator with a neat diagram and list out its outstanding features over other collectors. [8]

b) What are the factors considered in classification of coal burning methods. Classify the combustion systems used for coal burning and explain the principle of over feed stoker. [7]

3 a) Why is supercharging is necessary in diesel plants? What are the methods used for supercharging the diesel engine? What are the advantages of supercharging as fuel supply and overall efficiency of the plant are concerned? [7]

b) With a neat sketch explain the working of a closed cycle gas turbine plant, and derive the expression for thermal efficiency. [8]

4 a) What do you understand by pump storage plant? What are the advantages and disadvantages of this power plant? Where can such schemes are best applied? [8]

b) How the dams are classified? What are the factors considered in selecting a type of dam? Explain the functioning of a solid gravity dam. [7]

5 a) What is a moderator in nuclear reaction? Explain the desirable properties of good moderator. [7]

b) With a neat sketch explain the working of liquid metal cooled reactor. Write its advantages and disadvantages. [8]

Code No: **R42039** **R10** **Set No. 2**

6 a) Explain the advantages associated with combined working of power plants [7]

b) A load duration curve of a system is a straight line, the maximum and minimum loads being 100 MW and 20 MW respectively. The load is supplied by base load and peak load plants. The total cost of both is given as.
For base load plant: Rs. 200/kW-year + 5 P/kWh
For peak load plant: Rs. 50/kW-year + 10 P/kWh
For minimum overall cost, determine the load shared by peak load plant and annual load factor for both stations. [8]

7 a) With a neat sketch explain the working of Westinghouse oxygen analyser. [7]

b) With a neat sketch explain how moisture in CO_2 circuit of a reactor can be measured. [8]

8 a) Find the cost of generation per kW – hr from the following data
Station capacity= 100 MW
Capital cost= Rs. 12000/kW – installed
Annual charges= 10% of capital
Fuel consumption= 0.7 kg/kW-hr
Cost of the fuel= Rs. 500/tonne
Salaries and wages= Rs. 600×10^4
Maximum demand= 60 MW
Load factor= 30% [8]

b) What are the different sources of CO_2 emission? Discuss the effect of CO_2 pollutants on humans and environment. [7]

Code No: **R42039** **R10** **Set No. 3**

IV B.Tech II Semester Regular/Supplementary Examinations, April - 2015

POWER PLANT ENGINEERING

(Mechanical Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1 a) What is the necessity of coal storage? Discuss the different methods used for coal storage at plant. [8]

b) With a neat sketch explain the working of vacuum extraction ash handling system. [7]

2 a) What is the function of a cooling tower in a modern steam power plant? With a neat sketch explain the working of induced draft cooling tower. [7]

b) With a neat sketch explain the working of travelling grate stoker. Write its advantages and disadvantages. [8]

3 a) What are the advantages of diesel power plants over thermal power plants? Why diesel plants are not used for high capacity? What are the drawbacks when used for high capacity compared to steam plants? [8]

b) With a neat sketch explain the working of an open cycle gas turbine plant? Write its advantages in comparison with closed cycle gas turbine plant. [7]

4 a) What do you understand by base load and peak load hydro power plants? What type of power plants are used for base load and peal load plants and why? What are the factors considered in selecting a hydro electric power plant? [8]

b) What topological features compel to use shaft spill way? What are its advantages and disadvantages over the other types? [7]

5 a) Draw a neat sketch of a boiling water nuclear reactor and explain the functioning of different components. Write is advantages and disadvantages. [8]

b) Discuss the various factors to be considered while selecting the site for nuclear power stations. [7]

Code No: **R42039** **R10** **Set No. 3**

6 a) Explain the working of run-of-river plant in combination with steam plant. [7]

b) The estimated cost of two power stations is Rs. Are given as follows
C_1=12500 KW + 2.75 KWh
C_2=12500 KW + 3 KWh
These two stations operate in paralles and supply a load having annual load duration curve as straight line joining two points 0-hours – 100MW and 8760 hrs – 10 MW
Find
a) minimum cost of generation
b) installed capacity of each station
c) annual load factor, capacity factor and use factor for each station. Assume plant II has 20% reserve. [8]

7 a) With a neat sketch explain the working of photo cell type smoke meter. [7]

b) Explain with a neat line diagram the circuit to analyse the gas for nuclear radiation. [8]

8 a) A new industry requires a maximum demand of 800 kW at 30% load factor. The following two power supplies are available.
i) Public supply charges Rs. 500 /kW of maximum demand and 40 P./kW-hr. The capital cost is 8 x 10^5 Rs and interest and depreciation charges on capital are 10%.
ii) A private oil engine station requires Rs. 3 x 10^6 capital. The interest and depreciation charges on capital are 12%. The maintenance and labour charges are10 P. per kW-hr energy generated. The fuel consumption is 0.35 kg/ kW – hr and the cost of the fuel is 80 P. per kg.
Find which supply is more economical. [9]

b) Explain about radioactive pollution caused by nuclear power plant. [6]

Code No: **R42039** **R10** **Set No. 4**

IV B.Tech II Semester Regular/Supplementary Examinations, April - 2015

POWER PLANT ENGINEERING

(Mechanical Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions

All Questions carry equal marks

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1 a) Why ash and dust handling problem is more difficult then coal handling problems? With a neat sketch explain the general layout of ash handling system. [8]

b) Draw a neat line diagram of inplant coal handling and indicate the names of the equipment used at different stages, explain their functioning. [7]

2 a) Write down the advantages and disadvantages of stoker firing over pulverized system of firing. [8]

b) What is the necessity of feed water treatment? With a neat sketch explain how removal of dissolved gases is done in external water treatment by using tray type deaerator. [7]

3 a) With a neat sketch explain the working of combined gas and steam power plant. Write the advantages of this system. [7]

b) Explain the methods that are employed to increase the thermal efficiency of a simple open cycle gas turbine plant. [8]

4 a) What do you understand by run-off power plant? Explain how its performance is increased by introducing a pondage in the plant. [7]

b) Define hydrograph and explain its importance in the design of storage type hydro electric power project. Explain the effect of time unit on the storage capacity of the catchment area required. [8]

5 a) Draw a neat diagram of pressurised water reactor nuclear power plant and explain the working. Write its advantages and disadvantages. [8]

b) Discuss the various factors to be considered while selecting the site for nuclear power stations. [7]

Code No: **R42039** **R10** **Set No. 4**

6 a) The estimated cost of two power stations in Rs. Are given as follows
C_1=12500 KW + 2.75 KWh
C_2=12500 KW + 3 KWh
These two stations operate in paralles and supply a load having annual load duration curve as straight line joining two points 0-hours – 100MW and 8760 hrs – 10 MW
Find
a) minimum cost of generation
b) installed capacity of each station
c) annual load factor, capacity factor and use factor for each station. Assume plant II has 20% reserve. [8]

b) Write a short note on the following
i). load factor
ii). diversity factor
iii). demand factor
iv). average load. [7]

7 a) With a neat sketch explain the working of reflected light dust monitor. [7]

b) Why oxygen level in the water is maintained low. Draw the circuit used to measure the dissolved O_2 in the water and explain. [8]

8 a) Estimate the generating cost per unit supplied from a power plant having the following data
Plant capacity = 120 MW.
Capital cost = Rs.600×10^6
Annual load factor = 40 %
Annual cost of fuel, taxation, oil and salaries = Rs.500000
Interest and depreciation = 12 % [8]

b) Discuss the harmful effects of CO_2, CO, compounds of sulphur and oxides of Nitrogen. [7]