

**QUESTION BANK**

**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING**

**Subject Code** : **EI 6002**  
**Subject Name** : **POWER PLANT INSTRUMENTATION**  
**Course** : **B.E. Electronics and Instrumentation Engineering.**  
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**UNIT - I**

**OVERVIEW OF POWER GENERATION**

*Survey of methods of power generation :- hydro, thermal, nuclear, solar and wind power – Importance of instrumentation in power generation – Thermal power plant – Building blocks – Combined Cycle System – Combined Heat and Power System – sub critical and supercritical boilers.*

**PART A**

1. Identify the two important use of surge tank. **(BT-1)**
2. Name the four commonly used moderators in nuclear power plants. **(BT-1)**
3. Summarize the functions of two important components of Nuclear power plant. **(BT-5)**
4. Classify the types of Wind power plant. **(BT-3)**
5. Express about enriched uranium. **(BT-2)**
6. List out the Advantages and Disadvantages of solar power plant. **(BT-1)**
7. Predict the role of instruments in solar and wind power generation system. **(BT-2)**
8. Examine the basic factors to be considered for thermal power plant? **(BT-3)**
9. Differentiate Sub-Critical Power and Super-Critical Power Plant **(BT-2)**
10. Give any two role of air preheater. **(BT-2)**
11. Differentiate between Renewable and Non-Renewable energy sources. **(BT-4)**
12. Generalize the essentials of a good steam boiler. **(BT-6)**
13. Name the three basic cycle of Thermal Power Plant. **(BT-1)**
14. Discuss the four significant need of instrumentation in power generation. **(BT-3)**
15. Classify the methods of power generation. **(BT-4)**
16. Combine Heat and Power System. **(BT-6)**

17. Tell the two primary functions of Economizer. (BT-1)
18. Define the term Cogeneration. (BT-1)
19. Point out the two important working principles of Solar Photo Voltaic Cell. (BT-4)
20. Summarize the two major importance of instrumentation in power generation (BT-5)

#### PART-B

1. Design a combined Heat and Power System in brief. (BT-6)
2. Describe Solar power plant with neat sketch. (BT-1)
3. Explain with a neat sketch the process of electric power generation using wind energy. (BT-5)
4. Distinguish the methods of power generation. (BT-2)
5. Describe the working of a thermal power plant with suitable building blocks. (BT-1)
6. Examine the measurement of radiation occurring in a nuclear plant and how to control it? (BT-3)
7. Distinguish between sub critical and supercritical boilers with example. (BT-2)
8. List the applications of cogeneration in power plant and Label the PI diagram of cogeneration plant (BT-1)
9. With schematic diagram explain Hydro Power plant generation. (BT-4)
10. Explain the importance of instrumentation in nuclear power plant and Survey of methods of power generation. (BT-4)

#### UNIT- II

#### MEASUREMENTS IN POWER PLANTS

*Measurement of feed water flow, air flow, steam flow and coal flow – Drum level measurement – Steam pressure and temperature measurement – Turbine speed and vibration measurement – Flue gas analyzer – Fuel composition analyzer*

#### PART A

1. Compare the two types of feed water heaters in a steam power plant in terms of uses. (BT-6)
2. List various methods of feed water flow measurement in power plant. (BT-1)
3. Examine the suitability of float type in boiler drum level measurement. (BT-3)
4. Classify the types of turbine speed measurement. (BT-3)
5. Tell the need of vibration monitoring in turbine. (BT-1)
6. Explain the principle of Dall tube? (BT-5)
7. Point out the significance of Stagnation point? (BT-4)
8. Demonstrate the principle of steam purity measurement. (BT-3)

9. What is pulverized coal? **(BT-4)**
10. Analyze the importance of drum level measurement? How is it taken care of? **(BT-4)**
11. Quote the digital methods of measuring speed. **(BT-1)**
12. Summarize the two importance of feedwater Analysis. **(BT-5)**
13. Name the five sensors used in measuring vibration **(BT-1)**
14. Examine the working principle of Orsat flue gas analyzer. **(BT-1)**
15. Quote the objective of Fuel Analysis? **(BT-1)**
16. Interpret the need of correction factor in temperature measurement of Steam in High Pressure Boiler?. **(BT-2)**
17. Give the two scales used for temperature measurements in power plants?. **(BT-2)**
18. Predict the need of connecting thermocouples in series and parallel during temperature measurement? **(BT-2)**
19. Express your view on two primary parameters to be monitored and controlled in a turbine. **(BT-2)**
20. Generalize the types of orifice? **(BT-6)**

#### **PART-B**

1. Explain the working of dissolved oxygen analyzer used in feed water analysis. **(BT-4)**
2. With suitable diagram, explain the principle of Electromagnetic type flow meters. Also mention its advantages and limitations. **(BT-4)**
3. List the parameters to be measured in Flue gas of Boiler. Describe in detail about the flue gas O<sub>2</sub> analyzer. **(BT-1)**
4. Classify the transducers based on Low, Medium and High temperature applications? Also list the major temperature measurement points and suggest suitable sensors in Thermal power plant. **(BT-3)**
5. Summarize how do you measure the speed of a turbine and what are the control mechanisms required to maintain optimum speed of the turbine?. **(BT-5)**
6. Describe ultimate and proximate analysis of a fuel. **(BT-1)**
7. Describe the working of gas chromatography for the analysis of fuel gas with a neat sketch. **(BT-1)**
8. Discuss the operation of LP and HP heaters in a steam power plant. **(BT-2)**
9. Interpret the importance of vibration analysis in Turbine. Also list the various techniques used for vibration measurement. Explain any one vibration measurement technique in detail. **(BT-2)**
10. Combine Primary and Secondary transducers in Pressure measurement? Explain the pressure measurement of steam in Power plant. **(BT-6)**

### UNIT – III

#### **BOILER CONTROL – I**

*Combustion of fuel and excess air – Firing rate demand – Steam temperature control – Control of deaerator – Drum level control – Single, two and three element control – Furnace draft control – implosion – flue gas dew point control – Trimming of combustion air – Soot blowing.*

#### **PART-A**

1. Describe the concept of excess air. **(BT-1)**
2. List the two basic types of deaerators. **(BT-1)**
3. Explain stoichiometric condition of combustion in fuel? **(BT-5)**
4. Evaluate the necessity for Steam temperature control. **(BT-5)**
5. Define Firing rate demand. **(BT-1)**
6. Design split-range control. **(BT-6)**
7. Examine the need for "Air/fuel ratio" control. **(BT-3)**
8. Predict the role of attemperator. **(BT-2)**
9. List the methods of Trimming **(BT-1)**
10. Quote the need of deaerator control. **(BT-1)**
11. Examine the role of boiler control. **(BT-3)**
12. Give the function of a deaerator in power plant and its importance. **(BT-2)**
13. Quote the Steam temperature control methods. **(BT-1).**
14. Give the requirements to be considered for firing due to load change. **(BT-2)**
15. Combine the two methods of Furnace draft control. **(BT-6)**
16. Differentiate the advantage of three element control with single element control. **(BT-4)**
17. Examine balanced draft in Boiler. **(BT-3)**
18. Infer Soot blowing. **(BT-4)**
19. Examine the predominant factor in setting of automatic controllers for optimum combustion efficiency? **(BT-3)**
20. Point out furnace draft and how to quantify furnace draft? **(BT-4)**

#### **PART-B**

1. Discuss about the single and two element three-element schemes of boiler drum level control. **(BT-2)**
2. With suitable sketches describe boiler following firing rate control and turbine following firing rate control. **(BT-1)**
3. Explain the methods of measurement of combustion air flow. **(BT-4)**

- List the two basic types of deaerators. Explain any one in detail. **(BT-1)**
- Describe how air is delivered to the furnace at the right conditions of now and temperature using air heater and different types of fans in the draught plant. **(BT-1)**
- Summarize about the various combustion control system adapted in Power plant. Explain the principle and operation of "Cross-limited" combustion control system with necessary diagram. **(BT-5)**
- Analyze the need of Air/fuel ratio control? What is meant by the term Oxygen trim control in Boiler? Explain the method of controlling the combustion by Oxygen trim control. **(BT-6)**
- Explain the flue gas dew point control. **(BT-4)**
- Discuss about Steam temperature control in detail. **(BT-2)**
- Examine how do you measure the air pollutants from a power plant and what are the control measures adopted to reduce the same? **(BT-3)**

#### UNIT IV

#### **BOILER CONTROL – II**

*Burners for liquid and solid fuels – Burner management – Furnace safety interlocks – Coal pulverizer control – Combustion control for liquid and solid fuel fired boilers – air/fuel ratio control – fluidized bed boiler – Cyclone furnace.*

#### **PART-A**

- Classify the functions performed by all burners. **(BT-3)**
- List the non-control problems when burning waste fuels. **(BT-1)**
- Summarize the coal burning problems that affect boiler. **(BT-5)**
- Distinguish single-point positioning control and parallel positioning control. **(BT-2)**
- Compare liquid and solid fuel fired boilers. **(BT-5)**
- Classify atomizing for different burners. **(BT-4)**
- Give cyclone furnace purge logic. **(BT-2)**
- Classify the basic elements for unit pulverizer system. **(BT-3)**
- Examine boiler purge logic. **(BT-1)**
- List the hazardous conditions arise when main fuel trip. **(BT-1)**
- Predict where we are in need of air fuel ratio control? **(BT-2)**
- Classify the coal feeders of volumetric coal feeders. **(BT-3)**
- Examine gas burner management logic. **(BT-1)**
- Compare gravimetric and volumetric coal feeders for excess air effect. **(BT-4)**

15. Generalize the factors affecting combustion efficiency of boiler. (BT-6)
16. Point out the predominant factor in setting of automatic controllers for optimum efficiency. (BT-4)
17. Express the degree of burner automation. (BT-2)
18. What is the use of pulverizer? (BT-1)
19. List the types of combustion control for liquid and gaseous fuel boilers. (BT-1)
20. Generalize the effects of fuel Btu variation. (BT-6)

### PART-B

1. Classify various burner management in detail. (BT-3)
2. Explain in detail about burners for liquid fuels. (BT-4)
3. With schematic diagram explain furnace safety interlocks. (BT-4)
4. Describe about burners for solid fuels. (BT-1)
5. Discuss about fluidized bed boiler with neat diagram. (BT-2)
6. Design combustion control for liquid fuel fired boiler. (BT-6)
7. Discuss air fuel ratio control in brief. (BT-2)
8. Describe coal pulverizer control with neat diagram. (BT-1)
9. Explain in detail about cyclone furnace with neat diagram. (BT-5)
10. Describe about combustion control for solid fuel fired boiler. (BT-1)

### UNIT V

#### CONTROL OF TURBINE

*Types of steam turbines – impulse and reaction turbines – compounding – Turbine governing system – Speed and Load control – Transient speed rise – Free governor mode operation – Automatic Load Frequency Control – Turbine oil system – Oil pressure drop relay – Oil cooling system – Turbine run up system.*

1. What is steam turbine? (BT-1)
2. Give the methods available for turbine governing system. (BT-2)
3. Compare impulse turbine with reaction turbine. (BT-5)
4. Classify steam turbines. (BT-3)
5. Compare throttle and nozzle control governing. (BT-4)
6. List the advantages and disadvantages of velocity compounded impulse turbine. (BT-1)
7. Design automatic load frequency control. (BT-6)
8. Give the control scheme for turbine speed control. (BT-2)
9. List the types of power in steam turbine practice. (BT-1)
10. Give the control scheme for turbine load control. (BT-2)

11. Point out the significance of oil cooling system. **(BT-4)**
12. List the types of cooling tower. **(BT-1)**
13. Give the parameters to be measured and controlled in a turbine. **(BT-2)**
14. Examine the transient speed rise in turbine. **(BT-3)**
15. Define blade velocity coefficient in turbine. **(BT-1)**
16. Analyze the control objective of turbine run up system. **(BT-4)**
17. Examine the forms of cooling apparatus employed in power plants. **(BT-3)**
18. Develop oil pressure drop relay in turbine. **(BT-6)**
19. Define speed ratio in turbine. **(BT-1)**
20. Summarize the problems occur in design turbine governing system. **(BT-5)**

#### **PART-B**

1. With schematic diagram explain impulse turbine. **(BT-5)**
2. Describe briefly various methods of steam turbine governing. **(BT-1)**
3. Discuss various control schemes for speed and load control in turbine. **(BT-2)**
4. Describe various cooling systems in turbine. **(BT-1)**
5. Discuss various control schemes used for automatic load frequency control. **(BT-2)**
6. Design oil pressure drop relay in turbine. **(BT-6)**
7. Classify various methods of compounding steam turbine. **(BT-3)**
8. Explain about free governor mode operation in detail. **(BT-4)**
9. Describe briefly oil cooling system in turbine. **(BT-1)**
10. Explain about turbine oil system with neat diagram. **(BT-4)**