## SIDDHARTH  GROUP OF INSTITUTIONS :: PUTTUR
### (AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517583
### **QUESTION BANK**

**Subject with Code :** Steam Engineering (19ME3106)   **Course & Branch**: B.Tech - ME

**Year &Sem:** M.Tech (TE) & II-Sem   **Regulation:** R19

### UNIT –I (Introduction of Boilers)

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| 1 | | Explain the formation of steam with T-S Diagram | 10 M |
| 2 | | Define the quality of steam and also write the method of measuring the steam quality | 10M |
| 3 | (a) | Draw and identify various lines in Mollier Diagram | 5 M |
| | (b) | Find the Enthalpy and Entropy of steam when the pressure is 2 MPa and Specific Volume  0.09 m$^3$/Kg | 5 M |
| 4 | | A Vessel of Volume 0.04 m$^3$ contains a mixture of Saturated Water and Saturated Steam at Temperature 250$^o$C. The mass of Liquid Pressure is 9 Kg. Find the Pressure, Mass, Specific Volume, Enthalpy, Entropy and Internal Energy | 10M |
| 5 | (a) | How Boilers are classified. Explain | 5 M |
| | (b) | How do you check the quality of feed water supplied to the Boiler | 5 M |
| 6 | (a) | Differentiate between Fire tube boiler and Water Tube Boiler | 5 M |
| | (b) | Elucidate the working of Babcock and Wilcock Boiler with a neat sketch | 5 M |
| 7 | (a) | What is the purpose of High Pressure boiler and describe the working of Lamount boiler with a neat sketch | 5 M |
| | (b) | Name various types of Boiler Mountings used for the safety of Boilers and explain any one in detail | 5 M |
| 8 | | Illustrate the working of the following boiler mountings | 10 M |
| | | (i)  Safety Valve (ii) Feed Check Valve  (iii) Blow of Cock | |
| 9 | | Name the accessories used for increasing the efficiency of Boiler and explicate the function of any three with a neat sketch | 10M |
| 10 | (a) | Calculate the adiabatic Flame temperature for the combustion of flue gas containing 96% Methane, 0.8% Carbon dioxide and 3.2% Nitrogen when burnt in theoretical air | 5M |
| | (b) | Write a brief note on IBR and Boiler standards | 5M |

### UNIT –II (Piping & Insulation)

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| 1 | | Write the procedure for the designing of Steam piping System | 10 M |
| 2 | (a) | What are basic requirements of piping system in Boilers | 5 M |
| | (b) | Name the materials used in the Piping system of Boilers along with its functions | 5 M |

| 3 | (a) | Mention the importance of the Insulation for steam piping system | 5 M |
| | (b) | Name the insulating materials used for the steam piping along with its properties | 5 M |
| 4 | | Derive an expression for the economic thickness of Insulation | 10 M |
| 5 | (a) | What is the importance of heat recovery systems in Boiler | 5 M |
| | (b) | Mention the advantages of heat recovery system | 5 M |
| 6 | (a) | State the objectives of refractory materials | 5 M |
| | (b) | Write the classification of refractory material with an examples | 5 M |
| 7 | (a) | List the properties of refractory materials | 5 M |
| | (b) | Summarize the applications of refractory material | 5 M |
| 8 | | Mention the importance and types of furnace wall design | 10 M |
| 9 | | What are the factors affecting the Performance of Boiler. Explain them in detail | 10 M |
| 10 | | List out various types of heat losses in boilers | 10 M |

## UNIT –III (Steam Systems)

| 1 | | Draw the line diagram of steam generating facility and explain all the components | 10 M |
| 2 | | Write the procedure for the design of steam generating facility for commercial use | 10 M |
| 3 | (a) | How do you measure the pressure loss in the steam distribution system | 5 M |
| | (b) | Determine the steam distribution losses between two points of a steam pipe 1 km apart in a 150mm bore horizontal pipe work system. The water flow rate is 45m$^3$/hr at 15$^0$C and the friction factor for this pipe is taken as 0.005 | 5 M |
| 4 | | How do you assess the steam distribution losses in a steam pipe of steam power plant | 10 M |
| 5 | (a) | What is the importance of steam leakage in steam distribution system | 5 M |
| | (b) | Mention the remedial actions for eliminating the steam leakage | 5M |
| 6 | (a) | Steam traps increase the efficiency of the distribution system. Justify | 5 M |
| | (b) | Illustrate the working of Inverted bucket steam trap with a neat sketch | 5M |
| 7 | | Discuss about steam traps used in steam distribution system in detail | 10 M |
| 8 | (a) | Explain the installation procedure of steam traps in distribution system | 5 M |
| | (b) | Evaluate the benefits of condensate recovery system | 5 M |
| 9 | (a) | Write a short note on flash steam recovery | 5 M |
| | (b) | The hot condensate at 7 bar with heat content of 721 kJ/kg released to atm. Pressure with heat content of 419 kJ/kg. The excess heat is used for flash steam generation. Find percentage of flash steam evaporated. Consider Latent heat as 22.58kJ/kg. | 5 M |
| 10 | (a) | Describe the working of flash vessel with a neat sketch | 5M |

| | (b) | Elaborate the applications of steam systems | 5M |

**UNIT –IV (Boiler Performance Assessment)**

| 1 | (a) | Express the importance of assessing boiler performance | 5 M |
| | (b) | The following data relates to a coal fired boiler. Steam generated is 8 tons/hr: steam pressure and temperature are 10 kgf/cm$^2$ and 180$^0$C; Enthalpy of Steam (Dry & Saturated) at 10 kgf/cm2 is 665 Kcal/Kg Feed water temperature is 85 Kcal/kg; Quantity of coal Consumed is 1.6 tons/hr; Gross Calorific Value is 4000 Kcal/Kg. Find the efficiency of the boiler and the evaporation rate. | 5 M |
| 2 | | Estimate the performance of the boiler in Direct and Indirect Methods | 10 M |
| 3 | | Discuss in detail about the Performance test codes of boilers | 10 M |
| 4 | | Describe the working of Orsat Apparatus for Flue gas analysis with a neat sketch | 10 M |
| 5 | | In detail discuss about the various losses associated with the operation of Boiler | 10 M |
| 6 | (a) | Write a short notes on Proximate and Ultimate analysis of coal | 5 M |
| | (b) | Ultimate analysis of coal burnt in a boiler consists of 84% Carbon, 9% Hydrogen and the remaining 7% combustibles. Determine the mass of dry flue gases if the orsat analysis has given the following results: CO2- 8.75%, O2- 8%, Co- 2.25% and N2- 81% | 5 M |
| 7 | | The following data referred to oil fired boiler. Find the boiler efficiency.<br>**Ultimate Analysis**: C-84%, H2- 12%, N2-0.5%, O2-1.5%, S- 1.5%, Moisture – 0.5%, GCV of fuel – 10000 Kcal/Kg, Fuel firing rate – 2648.125 Kg/hr, Surface temperature of the boiler as 80$^0$C, Surface area of boiler- 90m$^2$, humidity- 0.025 kg/kg of air, Wind speed 3.8 m/s<br>**Flue gas analysis:** Flue gas temperature- 190$^0$C, Ambient temperature – 30$^0$C, % CO2 in flue gas by volume – 10.8, %O2 in flue gas by Volume- 7.4. | 10 M |
| 8 | | Elaborate the factors affecting the boiler performance | 10 M |
| 9 | | Name and Explain the parameters needed for measuring boiler efficiency | 10 M |
| 10 | | Boiler accessories increase the performance of boiler? Justify | 10 M |

**UNIT –V (Energy Conservation and Waste Minimization)**

| 1. | (a) | How can you conserve the energy in Boilers? | 5 M |
| | (b) | Write a short note on Waste Minimization | 5 M |
| 2 | | Classify the Waste Minimization Techniques and explain them in detail | 10 M |
| 3 | | Illustrate various steps involved in the Waste Minimization program | 10 M |
| 4 | | Asses the basic causes of Waste in Steam Power Plant | 10 M |

| 5 | (a) | How do you Evaluate the Economic Variability of Waste Minimization | 5 M |
|---|-----|---------------------------------------------------------------------|-----|
|   | (b) | Identify various types of Wastes and its possible resources in Steam Power Plant | 5 M |
| 6 |     | Explain various Process Control Loops in Boilers | 10 M |
| 7 | (a) | Process Instrumentation system is needed for controlling the Boiler. Justify | 5 M |
|   | (b) | Write a short notes on the importance of Control and Monitoring System of Boilers | 5M |
| 8 |     | Discuss about the working of various flow measurement Instruments in Boilers with neat sketch | 10 M |
| 9 | (a) | Describe the working of Bourdon tube pressure gauge with a neat sketch | 5 M |
|   | (b) | Name different type of temperature measurement Instruments used in boilers and explain them in brief | 5 M |
| 10 |    | What are the factors to be considered for the selection of Instruments in Boilers | 10M |

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