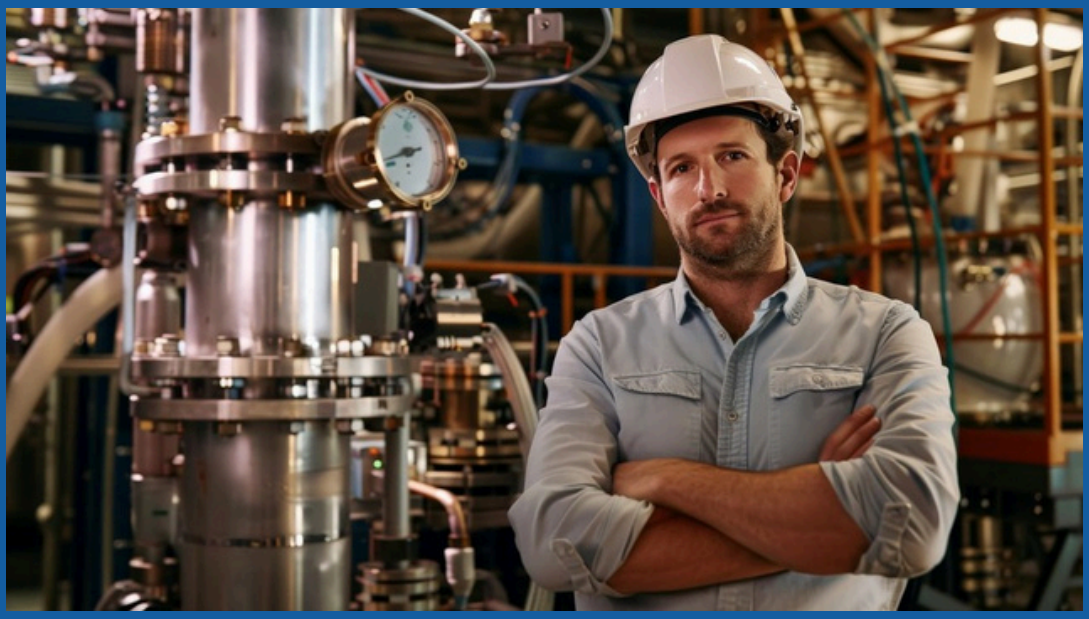
Study Material For Boiler Operation Engineer (BOE) Exams



Theory, Numerical Problems, MCQs and Boiler Drawing Problems from BOE Exams

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GOVERNMENT OF KARNATAKA
DEPT. OF FACTORIES, BOILERS, INDUSTRIAL SAFETY AND HEALTH
Boiler Operation Engineer's Examination – 2017-18
Subject : BOILER PAPER-1
April-2018

Maximum Marks: 100
Duration: 2 Hours

Note: Answer all the questions.

PART – A

I. Write the correct answer against each question: 30x1= 30 marks

1. The presence of carbon monoxide in the flue gas means
   a. High excess air b. Poor combustion
   c. High thermal efficiency d. All the above

2. Combustion is a reaction in which a substance reacts with
   a. Hydrogen b. Nitrogen c. Oxygen d. Chlorine

3. Calorific value is measured in
   a. Kilojoule b. Kilograms c. Kilojoules/kg d. All the above

4. Which of the following is not a renewable source of energy?
   a.The sun b. Natural gas c. Wind d. Ocean tidal energy

5. Choose the fire tube boiler from the list.
   a. Lancashire boiler b. Cochran boiler c. Locomotive boiler d. All the above

6. If circulation of water takes place by the difference in density when the water is heated, the boiler is known as
   a. Natural circulation boiler b. Forced circulation boiler
   c. Internally fired boiler d. All the above

7. A device used to empty the boiler when required and to discharge the mud,scale or sediment collected at the bottom of the boiler is known as
   A. Safety valve b. Stop valve c. Fusible plug d. Blow off cock

8. An accessory of the boiler in the following is
   a .Feed pump b. Feed check valve c. Stop valve d. Blow off valve

9. The critical pressure at which latent heat of evaporation of water becomes zero is
   a. 278.35 bar b.100.6 bar c.221.2 bar d. None of the above

10. Superheating of steam is done at
    a. Constant pressure b. Constant volume
    c. Constant enthalpy d. None of the above

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11. A--------- is used in the boiler to put off fire when the water falls to the unsafe limit
a. Scanner b. Excess air c. Fusible plug d. All the above

12. The resistance to deformation of a body per unit area is known as
a. Strain b. Stress c. Modulus of elasticity d. Modulus of rigidity

13. Factor of safety is defined as ratio of
a. Ultimate stress to allowable stress
b. Ultimate stress to yield stress
c. Allowable stress to ultimate stress
d. Allowable stress to yield stress

14. Variation of shear stress in a circular shaft subjected to torsion is
a. Parabolic b. Linear c. Hyperbolic d. None of the above

15. The minimum capacity of any closed vessel which generates steam under IBR is
a. 227.5 litres b. 22.75 litres c. 22.75 kilolitres d. 2.275 litres

16. A rise in conductivity of boiler feed water indicates
a. Drop in contamination
b. Greater purity of feed water
c. Rise in contamination of feed water
d. It has got no relation with contamination of feed water.

17. Deaeration of boiler feed water is referred to as
a. Removal of silica
b.Removal of scales by blowdown
c. Removal of dissolved gases
d. All the above

18. Percentage rise in boiler efficiency for a 20 degree centigrade drop in flue gas temperature in airpreheater is
a. 0.1 b. 0.2 c. 10 d.1

19. Modern utility boilers are supported at the top and are of hanging type. It is to
a. Keep vertical
b. Allow free expansion
c. Restrict the expansion
d. None of the above

20. The use of primary air in boilers is for
a. Cooling the boiler and the wall
b. Taking ash to ESP
c. Carrying pulverized coal to furnace
d. All the above

21. Heat addition in boiler economizer is through
a. Latent heat b. Superheat c. Sensible heat d. All the above

22. pH value to be maintained in feed water is
a. 8.8 to 9.2 b. < 8.3 c. > 9.5 d. None of the above

23. Fish mouth opening is a term used to describe
a. PA fan impeller crack
b. Mill gear box crack
c, Boiler tube failure
d. FD fan blade crack

24. Hydrastep is mounted on
a. Boiler drum b. Economiser c. Reheater d. Superheater

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25. Flame intensity in a boiler is sensed by

a. Ignitor b. Scanner c. Cameras d. All the above

26. Balanced draft boilers have

a. Only FD fan b. Only ID fan c. Both FD fan and ID fan d. None of the above

27. For regulating the steam flow in power plant which of the following is used

a. Globe valve b. Gate valve c. Check valve d. Any of the above

28. In a water wall of modern utility boiler, the water flows from

a. Top to bottom b. Bottom to top c. Horizontally d. Any of the above

29. In a jet condenser,

a. There is mixing of steam and cooling water b. There is no mixing of steam and cooling water
c. Both [a] and [b] d. None of the above

30. The speed of rotor of rotary air preheater is

a. 10-20 RPM b. 100-200 RPM c. 50-100 RPM d. 1-2 RPM

PART - B

II. (a) Write True or False against each of the statements given below 8x2= 16 marks

1. Continuous blow down water is a waste and its heat cannot be recovered.
2. Gross calorific value of fuel is more than net calorific value.
3. Latent heat of steam increases as the pressure increases.
4. Volumetric capacity of ID fan will be same as that of FD fan of the same boiler.
5. Deaerator removes mainly CO2 from feed water.
6. Drum is the single heaviest component in a sub critical boiler.
7. Exit gas temperature should be maintained above condensing temperature of acidic fumes contained in the flue gas.
8. The indirect method of evaluating boiler efficiency is also called as heat loss method.

II. (b) Write the correct answer. 3x2=6 marks

9. A M.S. storage tank has a height of 300 cms and inner dia of 140 cms. What is the maximum volume of water it can contain?

a. 6200 litres b. 4620 litres c. 5130 litres d. 6100 litres

10. A safety valve opens at 180 Kg/ cm2 and gets reseated at 172.8 Kg/ cm2. What is the blow down of this safety valve?

a. 5.16% b. 4.8% c. 3.82% d. 4 %

11. A boiler is under O&M phase and 2 years old. If the maximum working pressure is 182 Kg/ cm2, what should be the hydro test pressure during renewal of certificate as per IBR?

a. 127 Kg/cm2 b.318.5 Kg/cm2 c. 227.5Kg/cm2 d. none of the above

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II. **(c) Answer the following in brief** **4X2 =8 marks**

12. What is excess air?
13. Mention two major differences between Indian coal and imported (Indonesia/ South Africa) coal.
14. What are the methods employed to control the reheat steam temperature in boiler?
15. What is meant by residence time of fuel particle in a pulverized fuel fired furnace?

PART – C

III. Answer the following in brief:- **5x3= 15 marks**

1. What is water tube boiler and what is smoke tube boiler?
2. What are the losses of heat in boiler?
3. What is the difference between corner fired and wall fired boiler?
4. What are the advantages of fluidised bed combustion?
5. What are the disadvantages of gate valve over globe valve?

PART – D

IV. Answer the following in detail:- **5x5= 25 marks**

1. What are the parameters required to estimate the boiler efficiency by direct method?
2. List out the boiler mountings.
3. Write short notes on economizer and safety valve.
4. A solid circular shaft of diameter 4cms is subjected to a torque of 5,280 Kgcm in a testing machine. Find the maximum shear stress induced.
5. Explain reheat cycle and what are its advantages over simple rankine cycle ?

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GOVERNMENT OF KARNATAKA
DEPT. OF FACTORIES, BOILERS, INDUSTRIAL SAFETY AND HEALTH
Boiler Operation Engineer's Examination – 2017-18
Subject : BOILER PAPER-2
April-2018

Maximum Marks: 100
Duration: 2 Hours

Note: Answer all the questions.

PART-A

I. Write the correct answer against each question: **30X1=30 Marks**

1) Secondary air in a pulverized fuel boiler is used to:
   a) Carry pulverized coal to the burners.
   b) Assist in complete combustion of fuel.
   c) Clean the boiler walls.
   d) Carry mill reject to reject coal bunkers.
2) What is sorbent in FBC?
   a) Sand b) Ash c) Lime Stone d) All of the above
3) Which type of raw coal feeder gives accurate reading for mill loading in T/hour?
   a) Volumetric feeder
   b) Gravimetric feeder
   c) Rotary feeder
   d) All of the above
4) LRSB's are used to remove ash deposits from
   a) Water walls b) RE-heaters c) Economizer hoppers d) ESP hoppers
5) Which of the following safety valve in power plant uses Superior quality metallurgy
   a) Drum b) Cold Re-heat c) Main Steam d) De-aerator
6) In a pulverized fuel boiler, the ash collection
   a) In bottom ash hopper is more than ESP
   b) In ESP hoppers more than bottom Ash hopper
   c) In ESP hoppers is same as that in Bottom ash hopper
   d) None of the above
7) For establishing Balanced draft in boiler requires
   a) Only FD Fans b) Only ID fans c) Both ID and FD fans d) None of the above
8) Flame intensity in a boiler is sensed by
   a) Ignitors b) Scanners c) Cameras d) None of the above
9) The efficiency of collection in ESP will _____ if the volume of flue gas passing through it is increased.
   a) Increase
   b) Remain the same
   c) Decrease
   d) First decrease and then increase

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10) Which gas is used for shielding of weld area in pressure parts during TIG welding
   a) Argon
   b) Helium
   c) Nitrogen
   d) Hydrogen
11) Excess penetration is a term used to describe
   a) Destructive testing of weld
   b) Defect in weld joint
   c) Holes in aeration pads in ESP
   d) All of the above
12) Which of the following liquid fuels has more viscosity
   a) Naphtha b) Light Diesel oil c) High speed Diesel d) Heavy fuel oil
13) In water walls of modern utility boiler, water flows from
   a) Top to bottom b) Bottom to top c) Horizontally d) Can be any one of the above
14) Dissolved oxygen from feed water is removed in
   a) Boiler Drum b) Low pressure heaters c) High pressure heaters d) De-aerator
15) Which equipment of power plant uses Sector plates?
   a) Primary air fans
   b) Scrapper conveyor
   c) Air pre-heater
   d) Main Turbine
16) Air leakage is normally more in
   a) Tubular air preheater
   b) Rotary air preheater
   c) Same in both
   d) None of the above
17) HP dozing in power plant is carried out in.
   a) Boiler drum b) De-aerator c) Feed water line d) Condensate line
18) What is the function of servomotor assembly in fans of modern boilers?
   a) To adjust the blade pitch
   b) To absorb shock loads
   c) To Transmit torque from motor to fan
   d) None of the above
19) Drum material 200 MW boiler is
   a) Alloy steel b) Carbon steel c) Stainless steel d) All of the above
20) Fish mouth opening is a term used to describe
   a) PA fan impeller cracks
   b) Boiler Tube Failure
   c) Mill gear box cracks
   d) None of the above
21) Which one is a boiler mounting
   a) Economizer b) Super heater c) Re-heater d) Boiler drum safety valve
22) Classifier is a part of
   a) Coal mill b) Coal feeder c) Coal bunker d) None of the above

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23) Thermal Power Plant Works on

a) Carnot cycle b) Rankine Cycle c) Modified Rankine Cycle d) None of the above

24) Modern utility Boilers are supported at the top and are hanging type. It is to _____

a) Keep vertical
b) Allow free expansion
c) Restrict expansion
d) None

25) Residual Life / Remnant Life Assessment (RLA) of Boiler is carried out as per IBR 1950 Regulation _____

a) 380 b) 391A c) 320 d) None of the above

26) Atomizing of HFO in burners is carried out through

a) Compressed Air b) Steam c) Flue gas d) Pure oxygen

27) On load cleaning of water wall tube surface is carried out by

a) Wall de-slaggers
b) LRSB's
c) Both of the above
d) None of the above

28) When steam is first being introduced into a piping system, it is important that

a) All valves be wide open
b) All drains be fully closed
c) All by pass valves are closed
d) All condensate is completely drained

29) The largest heat loss from boiler are caused by

a) Moisture in fuel
b) Moisture in air
c) Radiation and convection
d) Dry flue gas

30) Air / fuel ratio maintained in typical Bowl mill is

a) Around 2 b) Less than 1 c) Greater than 3 d) None of the above

PART-B

II. Write True or False against each of the statements given below:

15X2=30 Marks

1) Secondary Air sector has more seal leakages than a primary Air sector in a Tri-sector type Air Pre Heater.
2) Slagging occurs only in the first pass of pulverized fuel firing boiler.
3) Atomizing is a term related to oil firing.
4) Purging is a term related to Oil guns.
5) The function of orifices in coal pipe in a pulverized fuel tangential fired boiler is measuring of coal flow.

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6) Dissimilar Metal Weld (DMW) joints are found in a Water Wall portion of the boiler pressure parts.
7) Conversion value of 1600 psi into Kg/cm^2 is 112.49.
8) Balanced draft is a combination of Forced draught fan and Primary air fan.
9) Main Steam safety valve setting pressure will be less than Drum safety valve
10) Remnant Life Assessment (RLA) study for boiler pressure parts in water tube boilers will be carried out after 1,00,000 hours of operation as per IBR 391A b) (i).
11) The travel of Wall de-slagger lance is same as LRSB's lance.
12) Venturi in the primary air ducting is used for the measurement of pressure.
13) The typical ratio of bottom ash to fly ash in a tangential pulverized fuel fired boilers is 40:60
14) Economizer is used to heat primary air to improve boiler efficiency.
15) Modern utility boilers are Water tube boilers.

PART-C

III. Answer the following questions in brief: **5X3=15 Marks**

1) Define IBR Steam pipe
2) What it indicates, if chimney emits the smoke a) White b) Hazy brown c) Block
3) Which safety valve should blow first, the super heater or Drum and why?
4) What is the furnace purge and it's necessary?
5) Name the three main classification of coal?

PART-D

IV. Answer the following questions in detail : **5X5=25 Marks**

1) List any five advantages of pulverized coal firing system?
2) List advantages of CFBC boilers over AFBC boilers?
3) What are the principle heat losses that occur in a boiler?
4) What are the benefits of thermal insulation?
5) How loss of Ignition is dangerous? What action to be taken in such situation?

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DEPT. OF FACTORIES, BOILERS, INDUSTRIAL SAFETY AND HEALTH

Boiler Operation Engineer's Examination – 2017-18

Subject : Drawing

April-2018

Maximum Marks: 100
Duration: 2 Hours

Note: Answer all the five questions. All the five questions carry equal marks.

Q1. Draw proportionate free hand sketch of the following and name the parts (Any Two): (20)

a. Feed Check Valve
b. Water Level Gauge
c. Steam Globe Valve

Q2. Draw free hand sketch of general arrangement of water tube boiler and name the following parts and accessories. (20)

a. Water Wall
b. Bank Tubes
c. Primary Superheater
d. Economizer
e. Air Pre-Heater
f. Main Steam Stop Valve
g. CBD and IBD Valves

Q3. Fig1 shows front view an top view of an object (20)

a. Draw an isometric view
b. Give all dimensions

Q4. Draw a neat sketch of Spring loaded safety valve and indentify the different parts (20)

Q5. Draw a free hand sketch of the following:- (20)

a. Pressure Reducing with De-superheating Station.
b. Feed water Discharge Line with control station from Pump to Economizer Inlet.

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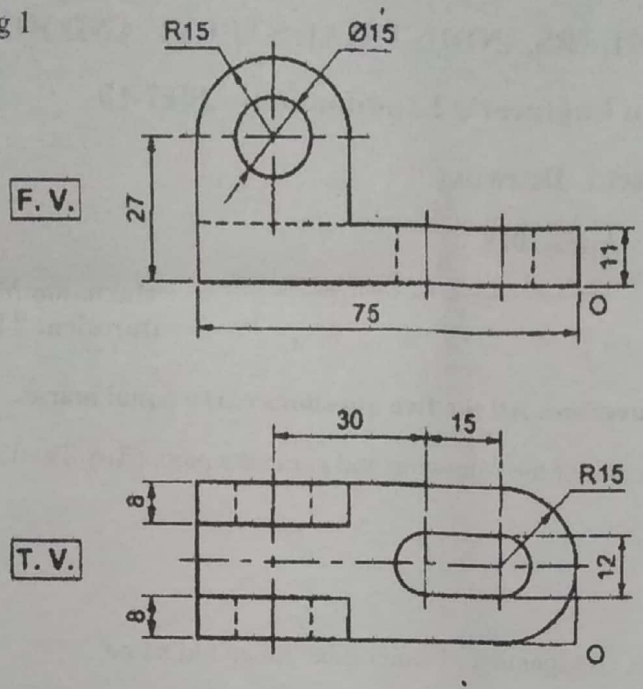
Fig 1



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