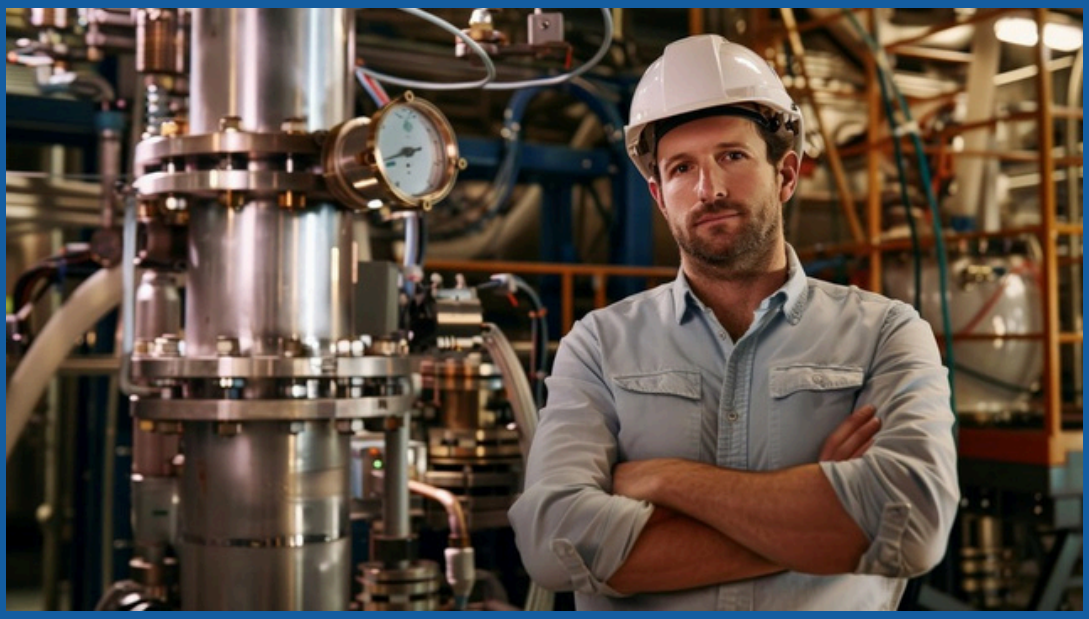
Study Material For Boiler Operation Engineer (BOE) Exams



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

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PROENGR.IN

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Telangana State Boiler Operation Engineers Examination – 2018
BOILER-1

Time: 2½ hrs | Max Marks : 100

Date: 14-10-2018

Note:

1) Candidates should attempt **FIVE (5)** questions subject to alternative or limitations, if any, mentioned herein or in each question. If more questions are answered, the last extra answers will be ignored.
2) Parts of the same questions must be answered together and must not be interposed by answer(s) to other question(s).
3) Question No. **ONE** is compulsory.
4) Candidates should answer the paper in ENGLISH only.

I. A) Answer all the questions **(10 x 1)**

1 The Natural Draught is produced by.....
2 A devise used to increase the temperature of saturated steam without raising its pressure is called.....
3 Express temperature 250 ^{0} C in Absolute temperature
4 When a circulation of water, in a boiler is done by a centrifugal pump then the boiler is known as
5 The efficiency of the boiler will _____ with the mechanical draught than Natural draught.
6 For maximum flue gas discharge through a chimney, the temperature of flue gases inside the chimney should the _____ the atmospheric temperature
7 What is stop valve?
8 Express the pressure of 42 Kg/sq.cms in Pounds/s.inch
9 In a Water Tube boiler system,major part of latent heat is received in .....
10 A device called _____ in a boiler put of fire in the furnace of the boiler when the level of water in the boiler falls to an unsafe limit.

I. B) Answer all the questions **(5 x 2)**

1 Mention the factors effect evaporation in boiler? 2
2 In a steam generator, drum outlet steam carries 3 tons of water and 21 tons of dry steam per hour. Calculate the dryness fraction of the steam? 2
3 Why steam valve should be opened slowly? 2
4 Name any two types of drum level controls. 2
5 What is the problem if boiler water contaminated with oil? 2

II a) What is Safety valve? Differentiate Line safety valve with Drum safety valve? 6
b) Explain about safety valve setting procedure in detail? 6
c) Discuss about automatic draft control systems 8

III a) What is the purpose of equalization/balancing valves given in high pressure Main steam Stop valve? And its advantages? 8
b) Explain in detail with sketch, about steam headering while one boiler is feeding steam already and another boiler to be started and steam to be headered along with existing one? 12

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IV a) How CFBC boiler different from PF fired boilers? 6

b) What are the Pollutant released during a boiler operation using coal as a fuel? 4

c) What are the pollution control equipment used in thermal power plants? and explain their usage? 10

V a) A hollow shaft is made . The ratio of the inside diameter to outside diameter is 0.6. The Material must not experience a shear stress greater than 500 KPa. The shaft must transmit 1.5 MW of mechanical power at 1500 rpm. Calculate the shaft OD and ID 10

b) Describe briefly about AFBC boiler. What are the advantages? 10

VI a) What is Waste heat recovery boilers? Why Waste heat recovery systems are designed with multiple steam circuits like LP and HP? 10

b) Explain about Heat Recovery systems used in high pressure boilers to improve the boiler efficiency in detail? 10

VII a) What is Boiler Preservation? What are the methods used for boiler preservation? Explain any one method in detail? 16

b) What is blow down and why it is needed? 4

VIII a) Below is the Ultimate analysis of fuel used in a boiler, The boiler is operated with 3.6 % oxygen. 15

Carbon %	Hydrogen %	Nitrogen%	O2 %	Sulphur %	Ash %
67.6	5	1.5	9.6	1.2	15.1

Calculate the following,

1. Theoretical air requirement in kgs per kg of fuel.
2. Excess Air %
3. Actual Air requirement in kg/kg of fuel

b) What is Stoichiometric combustion? 5

IX Explain about any **FIVE** 5x4

a. Mechanical De-aeration
b. 3 T's of combustion
c. Tangential firing in PF fired boilers
d. Write any four activities can be declared by boiler inspector as ' illegal'
e. Differentiate jet condenser and surface condenser
f. Boiler Drum
g. Attemperation

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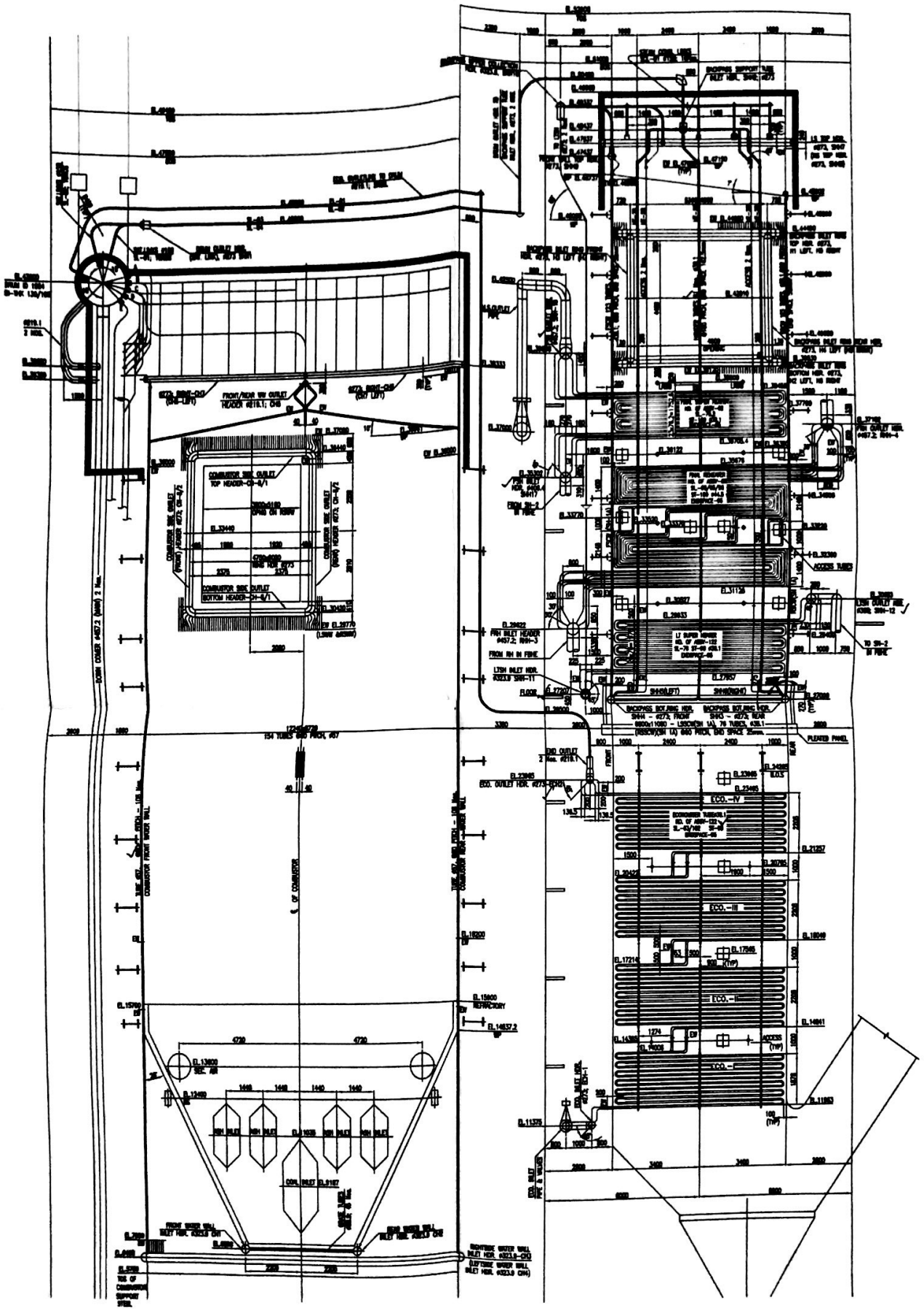

TYPICAL CFBC BOILER

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TELANGANA STATE BOILER OPERATION ENGINEERS EXAMINATIONS 2018

Reading Boiler Drawing

Time: 1Hr.30Min. Max.Marks: 50

Date: 14-10-2018

Note : Candidates should answer the paper in ENGLISH only.
Answer all questions

** ** **

I Answer the following questions by referring drawing (CFBC BOILER) supplied **15 X 2**

1. What is the Inside diameter of Steam drum? 1524
2. At what elevation Final super heater outlet header is located with reference to water wall inlet header? 33558
3. What is the Outside diameter of LTSH inlet header? 368
4. Is it an integral economizer? **(Yes/No)**
5. At what height steam drum is located with reference to economizer inlet header? 31625
6. What is the OD of Reheater tube? ϕ44.5
7. At what elevation Final super heater inlet header is located with reference to Economiser outlet header? 11937
8. What is the OD of Economiser tube? ϕ38.1
9. What is the pitch of water wall tubes? 80
10. What is the OD of main down comer pipe? ϕ457.2
11. At what elevation LTSH outlet header is located with reference to LTSH inlet header? 3496
12. How many hanger tubes are provided for back pass inlet ring? 61
13. How many assembly coils are provided in Economiser? 122
14. At what elevation Front wall top header is arranged with reference to Final Re-heater inlet header? - 9728
15. What is the outside diameter of pipe connected from Economiser outlet to steamdrum? ϕ219.1

II Name the pipe fittings shown in Fig.1 **5 X 1**

III. Draw schematic diagram of Boiler house showing all important equipments . And also name them **10**

IV. Draw a schematic diagram of for providing steam trap to steam pipeline and name parts **5**

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Telangana State Boiler Operation Engineers Examination – 2018
BOILER-2

Time: 2½ hrs | Max Marks : 100

Date: 14-10-2018

Note:

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3) Question No. **ONE** is compulsory.
4) Candidates should answer the paper in ENGLISH only.

I A) **Answer all the questions** **(10 x 1)**

1 At critical point ,the water and steam density becomes .....
2 Why U-loops or expansion bends are provided in steam pipeline design?
3 The amount of water evaporated in kg per kg of fuel burnt is called
4 In a steam condenser, the partial pressure of steam and air are 0.06 bar and 0.007 bar respectively. The condenser pressure is
5 The specific volume of the steam with increase in pressure decreases by ...
6 The Dry saturated steam at very low pressure, (5-10 kg/cm2) when throttled to atmospheric will become
7 Orsat meter is used for.....
8 In a recuperative air preheater, the heat is transferred from,
9 For fine adjustment of fluid flow which valve do you prefer?
10 Bomb Calorimeter is used to determine.....

I B) **Answer all the questions** **(5 x 2)**

1 Name two materials that are used for steam pipeline.
2 How do you say incomplete combustion in boiler?
3 Where do you find distortion and erosion of tubes in your boiler?
4 What is turbidity in water
5 Classification of steam traps

II a. What is Reverse osmosis system? How a RO Plant works explain with neat outline sketch? 12

b. Why Chlorination and De-chlorination done in RO based water treatment plant? 8

III a. How ash content of coal is determined? 10

b. What is LOI on fly ash? How is it different from unburnt carbon? 4

c. An AFBC Boiler generates about 150 MT of fly ash everyday with 16% of unburnt carbon. This ash is again re-fired in a CFBC boiler and final ash with 1% unburn arbon is drained out. If the CFBC boiler operates with fuel having 4000 K.Cal/kwh. Calculate the amount of coal saved by firing fly ash in CFBC boiler in a day? 6

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V	a.	Why silica slippage in treated water in a DM plant occurs?	6
	b.	What is silica carryover from Drum? What is the 2 types of carryover?	6
	c.	A boiler with 240 TPH capacity is operating at 200 TPH steam flow. The steam pressure at the final Super heater inlet is 110 Kg/cm2 and 496 deg C. A De-superheating unit operates at final SH inlet to control the steam temperature. The Attemperation flow per hour is 3 TPH. Due to Drum carry over the SH steam silica content at outlet is increased from 6 PPB to 18 PPB. The saturated steam silica during carryover was 20 PPB. What was the silica content in attemperation water?	8
VI	a.	What is De-aeration? What type of De-aeration is used in Your power plant and explain? Discuss in detail with sketch	12
	b.	What is LP dosing and what is the purpose of LP dosing? Discuss in detail	8
VI	a.	What is spontaneous ignition? What factors influence spontaneous ignition of coal?	8
	b.	What are the pre-cautionery measures required to avoid coal spontaneous ingnition in coal stock yard?	4
	c.	What is proximate analysis of coal? Differentiate it from Ultimate analysis?	8
VII	a.	What is radiant super-heater?	5
	b.	Why special precautions required while charging a vertical super heater?	5
	c.	In a battery of four boilers, one boiler is taken for shutdown. After sufficient cooling down of boiler, the super heater coils are found very hot. What reasons causes the SH coil to be in hot condition after long shutdown. What precautions to be taken to avoid?	10
VIII	a.	What are the Common losses occur in your boiler? Explain them as per the importance and its impact on boiler efficiency?	10
	b.	A boiler operating in Coal with Heat value of 32000 Kj/kg. Following are the parameters of the boiler. Flue gas temp – 135 Deg. C The ambient temperature – 25 Deg Total Moisture on fuel – 7%. Calculate the Loss due to moisture. What is the impact on the boiler efficiency if the moisture on fuel increases to 15% due to monsoon.	10
IX		Answer any **FIVE** in detail	5x4
	a.	Phosphate hide out	
	b.	Surface condenser	
	c.	Name 4 nos of different types of flanges.	
	d.	Mixed bed	
	e.	Volatile Matter on Coal	
	f.	Factors affecting performance of ESP	
	g.	Hydrazine	

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