



GOVERNMENT OF KARNATAKA

DEPARTMENT OF FACTORIES, BOILERS, INDUSTRIAL SAFETY AND HEALTH  
BOILER OPERATION ENGINEERS EXAMINATION - 2023

SUBJECT: BOILER PAPER-2

REGISTER NUMBER

2 3 B 0 5

MAXIMUM MARKS: 100

TIME: 3 HOURS

I. Choose the correct answer against each question.

25 X 1 = 25marks

- 1) The purpose of fins on convector tube is,  
a) Make it Lighter b) Strengthen the tube  c) Increase heat transfer d) Prevent Rupture
- 2) The size of the boiler tube is specified by  
a) Outside diameter b) Inside diameter & thickness  c) Outside diameter & thickness  
d) Mean diameter & thickness
- 3) The Rankine efficiency is  
a) 10-20% b) 20-30%  c) 35-45% d) 60-75%
- 4) The ratio of work done per cycle to the swept volume in case of air compressor is called  
a) Compressor efficiency b) Compression ratio  
 c) Mean effective pressure d) Compression index
- 5) The power required for an induced draught fan as compared to forced draught fan in a boiler of the same capacity is,  
a) Same b) More  c) Less d) Depends on fuel fired
- 6) The short term over heating usually exhibits  
 a) Thin lip longitudinal rupture b) Thick lip longitudinal rupture  
c) Traverse cracks d) Severe pitting
- 7) The percentage of carbon in medium carbon steel is  
a) 0 to 0.05 % b) 0.05 to 0.3 %  c) 0.3 to 0.6 % d) 0.6 to 2.1%
- 8) Young's modulus of perfectly rigid body is  
 a) Zero b) Unity c) 10 d) Infinity
- 9) Which of the following boiler is most suitable to meet fluctuating steam demand  
 a) Locomotive boiler b) Lancashire boiler  
c) Babcock & Wilcox boiler d) Cornish boiler
- 10) The air pressure at the fuel bed is reduced below that of atmosphere by means of a fan placed at or near the bottom of the chimney to produce draught, such draught is called as  
 a) Natural Draught b) Forced draught c) Induced draught d) Balanced draught
- 11) The vacuum obtained in a condenser depends on  
a) Type of condenser used  b) Quantity of steam admitted  
c) Pressure of cooling water d) Temperature of cooling water
- 12) The standard value of atmospheric pressure at sea level is  
a) 10.13 bar  b) 1.013 bar c) 101.3 bar d) 0.1013 bar
- 13) The modulus of elasticity of mild steel is approximately  
a) 80kn/mm<sup>2</sup> b) 100kn/mm<sup>2</sup>  c) 110 kn/mm<sup>2</sup> d) 210 kn/mm<sup>2</sup>
- 14) Efficiency of thermal cycle increases by  
a) Regeneration  b) Reheating of steam  
c) Regeneration and Reheating of steam d) Cooling of steam



- 15) Air leaking into the condenser reduces  
 a) Turbine output                      b) Cooling capacity  
 c) Life of the condenser              d) All of the above
- 16) Chances of sediments depositing inside the surface of water tubes is less due to-  
 a) High working pressure  
 b) Low working pressure  
 c) Natural circulation boiler  
 d) Forced circulation
- 17) Creep failures in boiler tubes are detected with  
 a) Changes in tube wall thickness  
 b) Severe bulging of tube  
 c) Microstructure examination  
 d) Traverse cracking of tube walls
- 18) The ideal position of an economizer in a boiler is  
 a) After FD fan in Combustion air path  
 b) After APH in Flue gas path  
 c) Before APH in flue gas path  
 a) Before ID fan in Flue gas path
- 19) Super heater tubes are made of  
 a) Low carbon steel  
 b) Medium carbon steel  
 c) Alloy steel  
 d) Wrought Iron
- 20) \_\_\_\_\_ is used to transport fine fuel particles from coal mill to boiler floor at different elevations as per the demand.  
 a) Seal air              b) Primary air              c) Secondary air              d) Tertiary air
- 21) The following is not a boiler accessory  
 a) Steam Stop Valve              b) Economizer              c) Super heater              d) Air preheater
- 22) Change in length of the steel bar depends on  
 a) Change in Temperature                      b) Original length  
 c) Co-efficient of thermal expansion              d) All of the above
- 23) Which of the following has minimum molecular mass?  
 a) Oxygen                      b) Hydrogen                      c) Nitrogen                      d) Water
- 24) Isothermal compression in air compressors is not practical because  
 a) It does not increase pressure much  
 b) It required big cylinder  
 c) Compressor has to run at very low speed to achieve it  
 d) It is not efficient
- 25) ESP's are used to collect \_\_\_\_\_ from flue gases  
 a) Carbon Monoxide                      b) Nitrogen Oxide (NOx)  
 c) Sulphur Oxide (Sox)                      d) Fine ash

**II. Write true or false against each statements given below**

**10 X 1 = 10marks**

- 1) Hooks law holds good up to plastic limit *True*
- 2) The latent heat of steam decreases with increase in pressure *True*
- 3) The liquid used in pressure gauge should have very low surface tension *T*
- 4) With natural draught the fuel consumption in a boiler can be reduced *F*
- 5)  $2\text{m}^3$  of hydrogen require  $1\text{m}^3$  of oxygen and produces  $2\text{m}^3$  of water *F*



- 6) In a convergent nozzle the cross section increases continuously from entrance to exit ✓
- 7) A good fuel should have a low ignition point ✓
- 8) A beam supported on more than two supports is called continuous beam ✓
- 9) The saturated pressure & saturated temperature meet at critical point ✓
- 10) When a shaft is subjected to torsion, the shear stress induced will be maximum at centre and zero at the circumference ✓

**III. Answer any 10 questions from the following**

**10 X 2 = 20 marks**

- 1) What is the effect of adding nickel to the alloy steel? ↑ hardness, tensile strength, & toughness ✓
- 2) Explain boiler accessories and list the major accessories? ✓
- 3) Define IBR "Steam pipe"? ✓
- 4) Explain steam trap & its significance? ✓
- 5) Explain "caustic embrittlement"? ✓
- 6) Explain the terms "Specific steam consumption & Heat rate"? ✓
- 7) Explain carry over in the boiler? ✓
- 8) List the probable reasons for incomplete combustion of fuel? ✓
- 9) List four causes for heavy black smoke while fuel oil is fired? ✓
- 10) List any three probable causes for high bed temperature & any three effects? ✓
- 11) List the positive & negative effects of excess air? ✓
- 12) Explain coal grindability index? ✓

**IV. Answer any 5 (five) questions from the following :**

**5X4=20 marks**

1. Write down the steps involved in chemical cleaning of the water touched surface of the water tube boilers ✓
2. What are the merits and demerits of stoker firing over pulverized firing system? ✓
3. How do you specify the Boilers? What are the various circuits involved in Boilers? ✓
4. Why is necessary for boiler blow down? Explain its effect on boiler efficiency. ✓
5. What are the important methods of the NDE (any five)? ✓
6. What are the salient features of Supercritical Boiler? ✓
7. Explain the term Regeneration? ✓
8. Name the four major circuits in steam power plant? ✓

**V. Answer any 5 (five) questions from the following :**

**5X5= 25 marks**

- 1) What is the purpose of ESP and Explain the working principle in brief? ✓
- 2) Define forced draft and induced draft cooling towers? List out the Advantages & disadvantages? ✓
- 3) Why "Intermittent blow down" and "Continuous blow down" operated in a boiler? ✓
- 4) Write five advantages of CFBC boilers over AFBC boilers. ✓
5. Discuss need of providing excess air for combustion. What is the disadvantage of providing too much of excess air? ✓
6. Explain the requirements for steam piping layout and drainage system. ✓
7. Name any two types of draught systems? Why the balanced draught system is preferred than other draught system? ✓
8. Under which regulation of IBR 1950 Remnant Life Assessment (RLA) study are carried out and List out the tests required to be carried out during Remnant Life Assessment study of boilers operating above 400 °C steam temperature. ✓

↑ Dipper  
 ↑ ↑  
 2) Thick