પ્રશ્નપુસ્તિકા ક્રમાંક

M

સમય :120 મિનિટ	Time : 120 Minutes
કુલ પ્રશ્નો : 200	Total Ques. : 200
કુલ ગુણ : 200	Total Marks : 200

This Question Booklet Contains 56 Printed Pages

ઉમેદવારનો બેઠક નંબર **Roll No:**

BWA

ઉમેદવારોને સૂચના

સૂચના ન મળે ત્યાં સુધી પ્રશ્નપુસ્તિકા ખોલવી નહીં

(1) પ્રત્યેક પ્રશ્નનો ઉત્તર A, B, C અને D પૈકી કોઈ એક છે અને ઉમેદવાર જો જવાબ ન આપવા માંગતા હોય તો તેમના માટે વિકલ્પ E OMR ઉત્તરપત્રમાં આપેલ છે. તમારે બધાજ પ્રશ્નોના ઉત્તર આપવા ફરજીયાત છે. તમારે આ સાથે **અલગ** OMR **ઉત્તરપત્રમાં જ ઉત્તર આપવાના છે.**

ઉદાહરણ તરીકે:

ભારતના રાષ્ટ્રપિતા તરીકે કોણ ઓળખાય છે?

(A) સરદાર પટેલ (B) સુભાષચંદ્ર બોઝ

(C) મહાત્મા ગાંધી (D) વિનોબા ભાવે

ઉત્તરપત્ર (OMR SHEET) માં

(A) (B) ● (D) (E)

ઉપર્યુક્ત ઉદાહરણનો જવાબ "C" છે. આથી "C" નું વર્તુળ કાળું (encode) કરેલ છે. સાચી અને ખોટી પદ્ધતિથી વર્તુળ ઘાટું કરવા બાબતની સૂચના OMR ની પાછળ આપેલ છે જેની નોંધ લેવી

(2) આ પાના ઉપર આપનો રોલ નંબર લખો.

(3) બધા જ પ્રશ્નો પૂરેપૂરા છપાયેલા છે કે કેમ તેની પ્રથમ ખાતરી કરી લો. જો પ્રશ્નો પૂરા છપાયા ન હોય અથવા કોઈ પૃષ્ઠ ફાટેલું હોય કે કોઈ પૃષ્ઠ સામેલ ન હોય અથવા તો અન્ય કોઈ ક્ષતિ જણાય તો તરત જ પ્રશ્નપુસ્તિકા નિરીક્ષક પાસેથી અચૂક બદલાવી લેવી.

ઉમેદવારને OMR ઉત્તરપત્ર મળ્યા બાદ જો તેઓ દ્વારા તેનો નાશ કરવામાં આવશે કે ગુમ કરવામાં આવશે તો તે ઉમેદવાર ગેરલાયક ઠેરાવવામાં આવશે તેમજ ભવિષ્યની પરીક્ષાઓમાં બેસવા માટે પ્રતિબંધ મુકવા ઉપરાંત ફોજદારી ગુનાને પણ પાત્ર બનશે.

(4) પરીક્ષા શરૂ થયેથી પૂરી થાય તે દરમ્યાન ઉમેદવાર પરીક્ષાર્થીએ પરીક્ષાખંડ છોડવાની મનાઈ છે.

(5) ઉમેદવારે પોતાના બેઠક ક્રમાંકની પ્રશ્નપુસ્તિકા અને OMR ઉત્તરપત્ર મળેલ છે તેની ખાતરી કરી લેવી અન્યથા ખંડ નિરીક્ષકનું તરત જ ધ્યાન દોરવું. ઉમેદવારને OMR ઉત્તરપત્ર મળે કે તરત જ તેમાં નિયત કરેલ જગ્યાએ પોતાનો બેઠક નંબર સ્વચ્છ અક્ષરે લખવાનો રહેશે. તેમજ બેઠક ક્રમાંક નીચે આપેલ વર્તુળ પણ ઘાટું કરવાનું રહેશે. મળેલ પ્રશ્નપત્રની સીરીઝ નિયત જગ્યાએ લખીને તેની નીચે તે સીરીઝ સામે આપેલ વર્તુળ પણ ઘાટું કરવાનું રહેશે. લખેલી વિગતો અને ઘાટું કરેલ વર્તુળની વિગતો યોગ્ય રીતે ભરાયેલ છે તેની ખાતરી કરી લેવી.

(6) પ્રત્યેક સાચા જવાબદીઠ 1 (એક) ગુણ મળવાપાત્ર થશે. આયોગ દ્વારા ગુણાંકન પદ્ધતિમાં માઈનસ પદ્ધતિ દાખલ કરવામાં આવી છે. જે મુજબ-

(i) પ્રત્યેક ખોટા જવાબદીઠ, ખાલી છોડેલ જવાબદીઠ તથા છેકછાક, ખોટી પદ્ધતિથી એક કરતાં વધુ વિકલ્પ દર્શાવેલ જવાબદીઠ 0.3 ગુણ કાપવામાં આવશે. પરંતુ જો ઉમેદવાર જવાબ આપવા માંગતા ન હોય અને વિકલ્પ (E) ઘાટું કરશે તો 0.3 ગુણ કાપવામાં આવશે નહીં.

(ii) આન્સર કી ફાઈનલ કરતી વખતે જો આયોગ દ્વારા એક પ્રશ્નના એકથી વધુ વિકલ્પો સાચા છે તેમ જાહેર કરવામાં આવે ત્યારે સાચા વિકલ્પ પૈકી કોઈપણ જવાબ માટે એક (1) ગુણ મળવાપાત્ર થશે.

(7) OMR ઉત્તરપત્રમાં નિશ્ચિત જગ્યા સિવાય ઉમેદવારે પોતાનો બેઠક ક્રમાંક લખવો નહીં તથા પોતાની ઓળખ છતી થાય તેવી નામ સહિતની અન્ય કોઈ પણ પ્રકારની નિશાની કરવાની સખત મનાઈ છે. તેમ છતાં પણ કોઈ પણ નિશાની કે ઓળખ માલૂમ પડશે તો તેને સંપૂર્ણ ગેરશિસ્ત ગણવામાં આવશે અને પરીક્ષા માટે ગેરલાયક ગણવામાં આવશે.

(8) OMR ઉત્તરપત્રના પ્રમાણપત્રમાં ઉમેદવાર તથા નિરીક્ષક બંનેની વાદળી / કાળી બોલપોઈન્ટ પેનથી સહી તથા ઉમેદવારના ડાબા હાથના અંગુઠાનું નિશાન ફરજિયાત છે. ઉમેદવારની સહી તથા ડાબા હાથના અંગુઠાના નિશાન વિનાની OMR ઉત્તરપત્રવાળા ઉમેદવાર ગેરલાયક ઠરશે.

(9) પરીક્ષા દરમ્યાન ઉમેદવાર પાસેથી કોઈ પણ સાહિત્ય, ગાઇડ, માર્ગદર્શિકા, કાપલી, સ્લીપો, અન્ય હસ્તલિખિત કે પ્રિન્ટેડ સાહિત્ય, મોબાઇલ ફોન, પેજર, કેલ્ક્યુલેટર કે અન્ય વીજાણુ ઉપકરણો હોવાનું જણાશે તો ઉમેદવારને ગેરલાયક ગણવામાં આવશે. તેમજ ભવિષ્યની પરીક્ષાઓમાં બેસવા માટે પ્રતિબંધ મુકવા પણ પગલાં લેવાશે.

(10) ચાલુ પરીક્ષા દરમ્યાન અંદરોઅંદર ગુસપુસ કરવી, અવાજ કરવો કે નિરીક્ષકની સૂચનાઓનું ઉલ્લંઘન કરવું તે ગેરશિસ્ત ગણાશે. કોઇ પણ પ્રકારની ગેરશિસ્ત બદલ પગલા લેવાશે.

(11) ઉમેદવારે વાદળી / કાળી બોલપોઈન્ટ પેનથી ઉત્તરો લખવાના છે. અન્ય શાહી કે પેન કે પેન્સિલ તથા સફેદ શાહીનો ઉપયોગ કરી શકશે નહીં તથા સફેદ શાહી (White Ink), બ્લેડ કે રબ્બરથી કે અન્ય કોઈ પણ રીતે કરેલા સુધારા માન્ય ગણાશે નહીં.

(12) આ જવાબવહી કમ્પ્યુટર દ્વારા તપાસવાની હોવાથી તે વળે, ફાટે કે બગડે નહીં તેની ખાસ કાળજી રાખવી તથા જવાબ વહીની ઘડી વાળવી નહીં.

(13) પ્રશ્નપુસ્તિકામાં કોરી જગ્યામાં રફકામ કરવું. તે માટે અલગ કાગળ આપવામાં આવશે નહીં. જવાબવહી માં કઈ પણ રફવર્ક કરવું નહીં. પ્રશ્નપુસ્તિકામાં જવાબો લખવાની મનાઈ છે. પરીક્ષાખંડ છોડતા પૂર્વે જવાબવહી (OMR Answer Sheet) નિરીક્ષકને સોંપવી, જ્યારે પ્રશ્નપુસ્તિકા ઉમેદવારો લઈ જઈ શકશે.

પરીક્ષા પૂરી થયા બાદ OMR ઉત્તરપત્ર વર્ગ નિરીક્ષકને સોંપ્યા બાદ જ વર્ગખંડ છોડવાનો રહેશે. તેમ કરવામાં કસૂર થયેથી ઉમેદવારને ગેરલાયક ઠેરવવામાં આવશે. તે ભવિષ્યની પરીક્ષાઓમાં બેસવા માટે પ્રતિબંધ મૂકવા તથા ફોજદારી પગલા લેવાને પણ પાત્ર થશે.

M

1. **What is entropy?**

   (A) Entropy is a measure of the net work done by a system

   (B) Entropy is a measure of the heat transfer of energy into a system

   (C) Entropy is a measure of the disorder of a system

   (D) Entropy is a measure of the potential energy of a system

2. **If 110 joule of heat is added to a gaseous system whose internal energy is 40 J, then the amount of external work done is**

   (A) 150 J **(B) 40 J**

   (C) 110 J **(D) 70 J**

3. **It is impossible to construct a device, which operating in a cycle will produce no effect other than transfer of heat from a cooler to a hotter body. This is**

   (A) Kelvin statement **(B) Clausius statement**

   (C) Planck statement **(D) Conservation of energy**

4. **Which of the following statements are correct?**

   1. An isothermal process is a thermodynamic process in which the temperature of the system remains constant.

   2. An adiabatic process is a thermodynamic process in which no heat is exchanged with the surroundings.

   3. An isobaric process is a thermodynamic process in which the pressure remains constant.

   4. An isenthalpic process is a thermodynamic process in which the entropy of the system remains constant.

   (A) 1 and 2 only **(B) 1, 2 and 3 only**

   (C) 1, 3 and 4 only **(D) 1, 2, 3 and 4**

5. **If temperature of the source is increased, then the efficiency of Carnot engine**

   (A) Increases

   (B) Decreases

   (C) Remains constant

   (D) First increases and then becomes constant

6. The heat absorbed or rejected during a polytropic process is

(A) $\left(\frac{\gamma - n}{\gamma - 1}\right)$ × work done

(B) $\left(\frac{\gamma - n}{\gamma - 1}\right)^2$ × work done

(C) $\left(\frac{\gamma - n}{\gamma - 1}\right)^{1/2}$ × work done

(D) $\left(\frac{\gamma - n}{\gamma - 1}\right)^3$ × work done

7. In a steam power plant, the enthalpy of steam at the inlet and outlet of steam turbine in the Rankine cycle are 4000 kJ/kg and 2500 kJ/kg, respectively. Neglecting the pump work, the steam consumption rate (in kg/kW h) will be

(A) 2.4

(B) 1.5

(C) 3

(D) 4.5

8. The thermal efficiency of a simple open gas turbine plant is improved by regeneration, as this

(A) Decreases the temperature of the gases at the turbine inlet

(B) Decreases the quantity of heat supplied in combustion chamber

(C) Increases the turbine output

(D) Lowers the work input to compressor

9. Which one of the following is the correct sequence of the position of the given components in a turbo–prop?

(A) Propeller, Compressor, Turbine, Burner

(B) Compressor, Propeller, Burner, Turbine

(C) Propeller, Compressor, Burner, Turbine

(D) Compressor, Propeller, Turbine, Burner

10. A vapour while condensing at 420°C transfers heat to water evaporating at 250°C. If ambient is at 35°C, what fraction of available energy is lost in the process?

(A) 0.18

(B) 0.22

(C) 0.26

(D) 0.30

11. Two reversible heat engines operate between the same hot reservoir but different cold reservoirs. Engine I works between temperatures T_H and T_C, while Engine II works between T_H and T_C' with $T_C' > T_C$. Based on Carnot's theorem, identify the correct comparison of their efficiencies.

(A) Engine II must be more efficient because its cold reservoir is at higher temperature

(B) Both engines must have the same efficiency because both are reversible

(C) The efficiencies cannot be compared unless the working substances are known

(D) Engine I must be more efficient because the temperature difference available to it is greater

12. Consider the following statements regarding the reheat factor in a steam turbine:

1. It depends on the exit pressure of the turbine.
2. It depends on the stage efficiency of the turbine.
3. It depends on the initial pressure and temperature of the steam.

Which of the above statements is/are correct?

(A) Only 1 (B) Only 2

(C) Only 1 and 2 (D) 1, 2 and 3

13. Which of the following statements are correct?

1. The Zeroth Law of Thermodynamics states that if two systems are each in thermal equilibrium with a third system, then they are in thermal equilibrium with each other.
2. The Zeroth Law forms the basis for the measurement of temperature.
3. The Zeroth Law implies that temperature is a transitive property.
4. The Zeroth Law is applicable only to ideal gases.

(A) 1 and 2 only (B) 1, 2 and 3 only

(C) 2 and 4 only (D) 1, 3 and 4 only

14. A pump raises pressure of a liquid from 1 bar to 30 bar. If the density of liquid is 990 kg/m^3, the isentropic work done in kJ/kg is

(A) 2.93 (B) 2.50

(C) 0.3 (D) 0.1

15. In a Rankine cycle, the work done by turbine during expansion of steam is 8 kJ, while the work required for pump to feedback the water into the boiler is 6 kJ. Determine the work ratio.

(A) 0.9 (B) 0.25

(C) 0.34 (D) 0.75

16. Consider the following statements regarding convection heat transfer from hot flue gases to a water tube:

1. Even though the flow of flue gases may be turbulent, a laminar flow region (boundary layer or film) exists close to the tube surface.
2. Heat transfer through this laminar film takes place by conduction.
3. Heat transfer through the laminar film takes place by convection.

Which of the above statements is/are correct?

(A) Only 1 (B) Only 2

(C) 1 and 2 only (D) 1, 2 and 3

17. The rate of energy emission from unit surface area through unit solid angle along a normal to surface is known as

(A) Emissivity (B) Transmissivity

(C) Reflectivity (D) Intensity of radiation

18. Consider the following statements regarding a grey body:

1. Its absorptivity is independent of the wavelength of incident radiation.
2. Its absorptivity is equal to its emissivity under thermal equilibrium conditions.
3. Its absorptivity varies with the wavelength of incident radiation.

Which of the above statements is/are correct?

(A) Only 1 (B) Only 2

(C) Only 1 and 2 (D) Only 1 and 3

19. Consider the following statements regarding the thermal diffusivity of a substance:

1. Thermal diffusivity is directly proportional to the thermal conductivity of the substance.
2. Thermal diffusivity is inversely proportional to the density of the substance.
3. Thermal diffusivity is inversely proportional to the specific heat of the substance.

Which of the above statements is/are correct?

(A) 1 only (B) 2 only

(C) 1 and 2 only (D) 1, 2 and 3

20. Consider the following substances:

1. Pure iron
2. Liquid water
3. Saturated water vapour
4. Pure aluminium

The thermal conductivity of these substances, when arranged in descending order of magnitude is

(A) 1, 2, 3, 4
(B) 2, 3, 1, 4
(C) 4, 1, 2, 3
(D) 4, 3, 2, 1

21. The wall of a chemical plant is modified with two additional layers having half the thermal conductivity of original wall material. The inner layer is of half the thickness and outer layer of same thickness as original wall. What will be the heat flow across the modified wall?

(A) Same as original
(B) Twice of original
(C) 50% of original
(D) 25% of original

22. For steady state one-dimensional heat conduction through a plane wall with constant thermal conductivity and no internal heat generation, the temperature distribution within the wall will be

(A) hyperbolic
(B) elliptic
(C) linear
(D) non-linear

23. Consider the following statements regarding the fouling factor in a heat exchanger:

1. The fouling factor depends on the operating temperature of the heat exchanger.
2. The fouling factor depends on the velocity of the fluid.
3. The fouling factor depends on the length of service of the heat exchanger.
4. The fouling factor depends on the surface area of the heat exchanger.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 2, 3 and 4 only
(C) 1, 3 and 4 only
(D) 1, 2 and 4 only

24. For a hydrodynamically and thermally fully developed laminar flow through a circular pipe of constant cross-section, the Nusselt number at constant wall heat flux (Nu_q) and that at constant wall temperature (Nu_T) are related as

(A) $Nu_q > Nu_T$ (B) $Nu_q = Nu_T$

(C) $Nu_q < Nu_T$ (D) $Nu_q = (Nu_T)^2$

25. Consider the following statements regarding the electric breakdown strength of insulating materials:

1. The electric breakdown strength depends on the nature of the applied voltage.
2. Imperfections in the dielectric material can affect its breakdown strength.
3. Pressure, temperature and humidity can influence the breakdown strength.

Which of the above statements is/are correct?

(A) Only 1 (B) Only 1 and 2

(C) Only 1 and 3 (D) 1, 2 and 3

26. The Stefan-Boltzmann law states that the emissive power of a black body is proportional to the

(A) Fourth power of the absolute temperature of the surface of the body

(B) Absolute pressure of the surface of the body

(C) Cube of the absolute pressure of the surface of the body

(D) Square of the low temperature of the surface of the body

27. _____ process induces compressive residual stresses on a component to nullify the residual stresses within a steel structure.

(A) Welding (B) Heat treatment

(C) Brazing (D) Shot peening

28. What happens when the thickness of insulation on a pipe exceeds the critical value?

(A) There is a decrease in the heat flow rate

(B) There is an increase in the heat flow rate

(C) The heat flow rate remains constant

(D) The temperature rises at the junction between pipe and insulation

29. An electric cable of aluminium conductor is of 40 mm diameter and is to be insulated with rubber having thermal conductivity k = 0.18 W/mK. The cable is exposed to air at a heat-transfer coefficient of h = 6 W/m^{2}K. The critical thickness of insulation required for the cable is

(A) 5 mm
(B) 10 mm
(C) 15 mm
(D) 20 mm

30. Heating of dry steam above saturation temperature is known as

(A) enthalpy
(B) superheating
(C) supersaturation
(D) supertempering

31. The point at which saturated vapour and saturated liquid coincide with each other is called as _____.

(A) melting point
(B) critical point
(C) boiling point
(D) triple point

32. In a P-T diagram for pure substance, the melting line has highest inclination with respect to the positive horizontal axis representing temperature for which type of substance?

(A) A substance that contracts on freezing.
(B) A substance that expands on freezing.
(C) A substance that has same volume on freezing.
(D) None of these

33. If the steam whose dryness fraction is to be determined is very wet, then to dry the steam partially before throttling, which of the following calorimeters is used?

(A) Tank or bucket calorimeter
(B) Throttling calorimeter
(C) Separating and throttling calorimeter
(D) Separating calorimeter

34. Which of the following is true?

(A) Quality of the liquid-vapour mixture is greater than 1.
(B) Quality of the compressed liquid ranges between zero and one.
(C) Quality of the dry saturated vapour is 1.
(D) Quality of the superheated vapour is greater than 1.

35. In an experiment to determine dryness fraction of steam, the mass of water separated was 1.2 kg in 15 minutes and the mass of steam passed out in the same time was 4.8 kg. Dryness fraction is

(A) 40%
(B) 25%
(C) 50%
(D) 80%

36. In the system, the ordinate of the Mollier diagram represents _____.

(A) enthalpy
(B) temperature
(C) entropy
(D) dryness fraction

37. In a P-V diagram for a pure substance, the constant temperature line in superheated region is _____.

(A) converging
(B) diverging
(C) intersecting
(D) parallel

38. At the critical point, which of the following statements is true?

(A) Liquid and vapour phases are indistinguishable
(B) Pressure becomes zero
(C) Only vapor exists
(D) Only liquid exists

39. During inspection, inspectors are required to advise the owner and the person in charge regarding

(A) Only the registration fee payable
(B) Management and upkeep of the boiler, including cleaning requirements
(C) Recruitment of boiler attendants
(D) Purchase of new boiler equipment

40. Match List-I with List-II and select the correct answer using the given codes:

List – I (SI engine operational mode)	List – II (Approximate A/F ratio)
P. Idling	1. 3 : 1
Q. Cruising	2. 10 : 1
R. Cold starting	3. 13 : 1
S. Acceleration	4. 20 : 1

The correct match is

(A) P – 3, Q – 4, R – 1, S – 2

(B) P – 4, Q – 1, R – 3, S – 2

(C) P – 2, Q – 4, R – 3, S – 1

(D) P – 4, Q – 2, R – 3, S – 1

41. Decrease of air-fuel ratio in spark ignition engines results in

(A) an increase of NO_x

(B) a decrease of CO and unburnt hydrocarbon

(C) an increase of CO and unburnt hydrocarbon

(D) none of the above

42. The required mass of oxygen to convert 1 kg of carbon into 11/3 kg of CO_2 is

(A) 8/3 kg (B) 4/3 kg

(C) 11/3 kg (D) 3/11 kg

43. When heat released by a substance is higher than the heat required for ignition of the substance, then which of the given combustion occurs?

(A) rapid (B) spontaneous

(C) complete (D) explosive

44. Consider the following statements:

1. Boiler is also known as steam generator.
2. As per Indian Boilers Act, 1923, boiler means any closed vessel exceeding 22.75 L in capacity
3. Supercritical boilers are operated above critical pressure range (221.2 bar).

Which of the above statements are correct?

(A) 1 and 2 only (B) 1 and 3 only

(C) 2 and 3 only (D) 1, 2 and 3

45. Match the following:

List-I		List-II
1. Boiler Accessories	a.	Gauge glass
2. Boiler Mountings	b.	Economizer
	c.	Soot blower
	d.	Fusible plug
	e.	Deaerator
	f.	Start-up vent
	g.	Manhole

The correct match is

(A) 1-b, c and e; 2-a, d, f and g
(B) 1-a, c and e; 2-b, d, f and g
(C) 1-a, d, f and g; 2-a, d, f and g
(D) 1-b, c and e; 2-b, c and e

46. Consider the following statements regarding travelling grate-fired boilers:

1. In a travelling grate-fired boiler, coal is fed onto a grate that moves at the bottom of the furnace.
2. Chain grate and bar grate are similar in working principle and differ mainly in the construction of the grate.
3. Travelling grate-fired boilers are suitable for burning strongly caking bituminous coal having low ash fusion temperature.

Which of the above statements is/are correct?

(A) 1 only
(B) 1 and 2 only
(C) 2 and 3 only
(D) 1, 2 and 3

47. Consider the following statements regarding Fluidized Bed Combustion (FBC) boiler:

1. Size of the FBC boiler is larger as compared to the conventional stoker-fired or pulverized boiler.
2. FBC boiler can be operated efficiently with a variety of fuels.
3. Coal can be fed either independently or in combination with other solid fuels into the same furnace.
4. SO_x formation can be minimized by addition of limestone or dolomite for high sulphur coals.

Which of the above statements are correct?

(A) 1 and 2 only
(B) 1, 2 and 3 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

48. Consider the following statements regarding Circulating Fluidized Bed Combustion (CFBC) Boiler:

1. In this fluidized bed principle, the bed particles are suspended in a stream of upwardly flowing air which enters from the bottom of the furnace through air distribution nozzles.
2. Loop seal is considered as the heart of a circulating fluidised bed.
3. CFBC requires huge mechanical cyclones to capture and recycle the solid particles.
4. Loss of Ignition (LOI) in fly ash is very less.

Which of the above statements are correct?

(A) 1 and 2 only
(B) 1, 2 and 3 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

49. Match the following:

List-I		List-II
1. Fire tube boiler	a.	Wilcox boiler
2. Water tube boiler	b.	Lancashire boiler
	c.	Cornish boiler
	d.	Babcock boiler

The correct match is

(A) 1-a and b; 2-c and d
(B) 1-b and c; 2-a and d
(C) 1-c and d; 2-a and b
(D) 1-a and d; 2-b and c

50. The main function of drum in a steam generator with single drum is to

(A) store water in drum
(B) store steam in drum
(C) separate steam from water in the drum
(D) remove salt from water in the drum

51. Consider the following statements regarding Cochran boiler:

1. Cochran boiler is a vertical fire tube boiler.
2. Cochran boiler has multiple fire tubes through which hot gases flow.
3. Water circulates inside the tubes and hot gases flow outside the tubes.
4. Cochran boiler has horizontal fire tubes.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 2 and 4 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

52. Consider the following statements regarding Benson boiler:

1. It can operate at supercritical pressure.
2. It is drum-less boiler.
3. In this, water transforms into steam without boiling.
4. There is no bubble formation in this boiler.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 2 and 4 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

53. Consider the following statements:

1. Lancashire boiler is forced circulation boiler.
2. Lancashire boiler is land type or stationary boiler.
3. Lancashire boiler is horizontal straight type boiler.
4. Lancashire boiler is externally fired boiler.

Which of the above statements are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

54. Consider the following statements:

1. Packaged boilers are mostly shop assembled.
2. Mostly liquid and gaseous fuels are used in packaged boilers.
3. Packaged boilers are mostly used to meet process steam requirement in industry.

Which of the above statements are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

55. Consider the following statements regarding Hopkinson's water gauge:

1. Hopkinson's water gauge is a boiler accessory used to indicate the water level inside the boiler.
2. It works on the principle of communicating vessels.
3. The upper end of the gauge glass is connected to the steam space, and the lower end is connected to the water space.
4. Gauge glass is different from guard glass

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 2 and 4 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

56. Consider the following statements regarding the fusible plug used in boilers:

1. It protects fire box crown plate, or the fire tube from burning due to low water level.
2. It consists of a hollow gun metal body screwed into the fire box crown.
3. Fusible metal is protected from direct contact with water or furnace gases by the two plugs.
4. During abnormal operation, the fusible plug remains submerged in water.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 2 and 4 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

57. Consider the following statements regarding an economizer used in boilers:

1. Economizer is a boiler accessory used to increase the efficiency of the boiler.
2. Economizer utilizes the heat of outgoing flue gases to preheat feed water.
3. Economizer is installed in the path of flue gases in between the exit from the boiler and the entry to the chimney.
4. Economizer reduces the fuel consumption and steaming rate is increased.
5. Economizer increases the temperature of steam produced in the boiler.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 2, 3 and 4 only
(C) 2, 3, 4 and 5 only
(D) 1, 2, 3, 4 and 5

58. A chimney is required to produce a static draught of 20 mm of water. The atmospheric air is at 20°C and has a density of 1.2 kg/m^3. The mean flue gas temperature in the chimney is 270°C and its density is 0.73 kg/m^3. The height of the chimney required is

(A) 32.5 m
(B) 42.5 m
(C) 52.5 m
(D) 62.5 m

59. Consider the following statements regarding steam jet draught:

1. Steam jet draught is an artificial draught system used in boilers.
2. Steam jet draught may be induced draught or forced draught.
3. Forced draught developed by steam jet is also known as turbine draught.
4. If the steam jet is directed into the smoke box near the stack, the air is forced through the flues to smoke box.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 2 and 4 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

60. Consider the following statements regarding fly ash produced in boilers:

1. Ash carried away by flue gases is called fly ash.
2. Due to the very small size of coal particles in a pulverized coal boiler, more fly ash is generated.
3. Higher fly ash content in flue gases creates problems in downstream heat exchanger units.
4. Fly ash is abrasive in nature and causes erosion when flue gas velocity is high.
5. Fly ash contains silica up to 60%.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 2, 3 and 4 only
(C) 2, 3, 4 and 5 only
(D) 1, 2, 3, 4 and 5

61. Consider the following statements regarding a reverse jet bag filter used for fly ash removal:

1. Reverse jet bag filter is used to separate fly ash before the flue gas is vented to the atmosphere.
2. In a reverse jet bag filter, cleaning of bags can be performed online without stopping the filtration process.
3. In a reverse jet bag filter, dust-laden flue gas normally flows from inside to outside of the bag.
4. Bags are cleaned by a short burst of compressed air injected through a solenoid valve and a set of nozzles.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 2 and 4 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

62. Consider the following statements regarding the effect of particulate resistivity on Electrostatic Precipitator (ESP) performance:

1. Resistivity of particulates is a major factor influencing the performance of an ESP.
2. Resistivity is defined as the electrical resistance of a dust sample having a cross-sectional area of 1 cm^2 and thickness of 1 cm.
3. If the resistivity of particulates is too low, then the particles discharge their charge slowly and escape from the collecting plate and come back to the gas stream again.
4. If the resistivity of particulates is too high, then particles do not give up their charge completely to the collecting electrode, resulting in charge accumulation on the collecting plate.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 2 and 4 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

63. Consider the following statements regarding liquid fuel systems used in boilers:

1. Liquid fuels used for operating boilers are stored in floating roof storage tank.
2. In some boilers, High Speed Diesel (HSD) is used as a starting fuel.
3. Day tank is a kind of small tank in which oil is pumped. From the day tank, oil is used in the boiler.
4. Storage tank for Heavy Fuel Oil (HFO) is jacketed with steam coils to keep the oil hot so that it can be pumped.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 2 and 4 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

64. Consider the following statements regarding screens used to screen crushed coal:

1. In vibrating screen, unbalance weight motors are mostly used to obtain vibration.
2. In normal vibrating screen, screen vibrates in accordance with the frequency of the applied vibrating force.
3. Coal with high moisture content cannot be screened by flip-flow screen.
4. Resonance screen is a horizontal screen having a screen frame with a natural frequency.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 2 and 4 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

65. Under the Gujarat Boiler Rules, 1966, the Chief Inspector is responsible for inquiring into

(A) Routine maintenance of all boilers

(B) Serious accidents to boilers

(C) Recruitment of boiler attendants

(D) Manufacture of boiler components

66. Consider the following statements regarding the formation and control of NO_x in a thermal power boiler:

1. In a thermal power boiler, NO_x is formed mainly due to the high furnace temperature and the high residence time of air in the furnace.
2. Post-combustion control methods and combustion control techniques are used to control NO_x emissions.
3. In post-combustion control methods, measures are taken to control the formation of NO_x during combustion.
4. In combustion control techniques, the NO_x content in the flue gas is reduced after combustion by suitable treatment methods.

Which of the above statements are correct?

(A) 1 and 2 only (B) 3 and 4 only

(C) 1, 3 and 4 only (D) 2, 3 and 4 only

67. Consider the following statements regarding Suspended Particulate Matter (SPM) in flue gas:

1. Flue gas contains small particles of dust, soot and fumes known as Suspended Particulate Matter (SPM).
2. Very fine particulate matter of size less than 10 microns (PM10) is known as Respirable Suspended Particulate Matter (RSPM).
3. Maximum permissible limit of RSPM is 100 $\mu g/m^3$.

Which of the above statements are correct?

(A) 1 and 2 only (B) 2 and 3 only

(C) 1 and 3 only (D) 1, 2 and 3

68. Consider the following statements regarding boiler feedwater treatment:

1. In a boiler, feedwater salts of calcium and magnesium are mainly responsible for the scale formation.
2. Sometimes, silica present in feedwater is evaporated and carried out in steam which forms an insoluble deposit on the turbine blade.
3. Soda ash (Na_2CO_3) treatment is an internal treatment process for boiler water.
4. In low pressure boiler, soda ash treatment cannot be used, as it forms caustic soda and increases with the increase in temperature.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 2 and 4 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

69. Consider the following statements regarding phosphate treatment in drum-type boilers:

1. Phosphate dosing is done at boiler drum which is at lower pressure.
2. Trisodium phosphate (Na_3PO_4), disodium phosphate (Na_2HPO_4) and monosodium phosphate (NaH_2PO_4) are used in boiler for dosing.
3. In congruent phosphate treatment, the ratio of sodium to phosphate ions (Na/PO_4) is maintained from 2.3 : 1 to 2.6 : 1.

Which of the above statements are correct?

(A) 1 and 2 only
(B) 1 and 3 only
(C) 2 and 3 only
(D) 1, 2 and 3

70. Consider the following statements regarding the ion-exchange process used for demineralization of boiler feedwater:

1. Water free from undissolved suspended solids passes through a cation exchanger containing a bed of cross-linked polymers called cation resin.
2. Cation resin contains hydrogen ions (H^+). When water passes through the resin bed, cations are substituted by H^+ ions of the resin.
3. Water coming out from cation exchanger is non-acidic in nature.
4. Anion exchanger contains another type of resin called as anion resin containing hydroxide ions OH^-.
5. When water from the cation passed through anion resin, anions are substituted by OH^- ions of the resin.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 2, 4 and 5 only
(C) 2, 3, 4 and 5 only
(D) 1, 2, 3, 4 and 5

71. Consider the following statements regarding the Reverse Osmosis (RO) process:

1. In the reverse osmosis process, liquid naturally moves through a semi-permeable membrane from an area of low salt concentration to an area of high salt concentration.
2. The pure water obtained after the reverse osmosis process is called the concentrate.

Which of the above statements is/are correct?

(A) 1 only
(B) 2 only
(C) Both 1 and 2
(D) Neither 1 nor 2

72. Consider the following statements regarding the alkalinity of boiler feedwater:

1. The alkalinity of water is due to the presence of hydroxide, carbonate and bicarbonate ions.
2. Methyl orange alkalinity (M-alkalinity) is known as total alkalinity, while P-alkalinity refers to phenolphthalein alkalinity.
3. When P = 0, the alkalinity is due entirely to hydroxide ions.
4. When P = M, the alkalinity is due entirely to bicarbonate ions.

Which of the above statements are correct?

(A) 1 and 2 only
(B) 1, 2 and 3 only
(C) 3 and 4 only
(D) 1, 2, 3 and 4

73. Consider the following statements regarding a deaerator used in a thermal power plant:

1. The main function of a deaerator is to remove dissolved solids from the feedwater.
2. It also serves the purpose of a storage tank from where feedwater is pumped into the boiler.
3. It is the place where feedwater is preheated before entering into the boiler.
4. Direct contact (mixing) tray type deaerator is commonly used in power plant.
5. If the deaerator pressure is 3 kg/cm^2 and the deaerator is placed at an elevation of 20 m, then the feed pump suction pressure will be approximately 5 kg/cm^2.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 2, 3, 4 and 5 only
(C) 1, 3 and 4 only
(D) 1, 2, 3, 4 and 5

74. Consider the following statements regarding boiler feed pumps used in a boiler house:

1. A boiler feed pump is used in a boiler house which supplies deaerated and low pressure dosed feedwater to the boiler.
2. Boiler drum pressure is higher than the discharge pressure of feed pump.
3. In a large boiler, turbo feed pump is preferred.
4. During non-availability of power, turbo feed pump can pump feedwater into the boiler by utilizing steam of the boiler.

Which of the above statements are correct?

(A) 1 and 2 only
(B) 1, 3 and 4 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

75. A boiler of capacity 250 tonne/hr is operating at a pressure of 120 kg/cm^2. The permissible limit of boiler water TDS is 70 mg/L. If the TDS of boiler feedwater is 5 mg/L, then the percentage blowdown and blowdown quantity are respectively

(A) Percentage blowdown = 5.5% and Blowdown quantity = 13.75 tonne/hr
(B) Percentage blowdown = 7.69% and Blowdown quantity = 19.23 tonne/hr
(C) Percentage blowdown = 10% and Blowdown quantity = 25 tonne/hr
(D) Percentage blowdown = 12.5% and Blowdown quantity = 31.25 tonne/hr

76. Consider the following statements regarding boiler waterside corrosion:

1. The most significant contributors to boiler waterside corrosion are dissolved oxygen, acid or caustic present in water.
2. Red oxide (hematite) corrosion compound is formed under oxidizing conditions.
3. Black oxide (magnetite) corrosion compound is formed under reducing conditions that typically exist in an operating boiler.
4. The hematite layer prevents further corrosion; therefore, this layer is desirable in a new boiler.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 3 and 4 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

77. Consider the following statements regarding carryover in a boiler:

1. Carryover is caused by the incomplete separation of steam from the steam–water mixture in the boiler drum.
2. Carryover may occur due to priming and foaming in the boiler.
3. Carryover results in deposits on superheater tubes and steam turbine blades, reducing efficiency and causing damage.
4. High boiler water level is one of the common causes of carryover.

Which of the above statements are correct?

(A) 1 and 2 only
(B) 1, 2 and 3 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

78. Consider the following statements regarding the Indian Boiler Regulations (IBR), 1950:

1. The Indian Boiler Regulations (IBR), 1950 provides provisions on materials, design, construction, fittings, mountings, welding, hydraulic testing, inspection and certification of boilers and boiler components.
2. IBR-approved materials and forms are used for the manufacture of boilers and boiler components.
3. Non-Destructive Testing (NDT) methods are optional recommendations rather than mandatory requirements for high-pressure IBR welded joints.
4. The provisions of IBR should be read along with the amendments, notifications and rules currently in force.

Which of the above statements are correct?

(A) 1 and 2 only
(B) 1, 2 and 4 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

79. Consider the following statements regarding the ASME Boiler and Pressure Vessel (PVs) Codes:

1. These codes establish rules of safety governing the design, fabrication and inspection of boilers and PVs and nuclear power plant components during construction.
2. The objective of the rules is to provide a margin for deterioration in service.
3. Advancements in design and material and the evidence of experience are constantly added by Addenda.
4. The ASME Boiler and Pressure Vessel Code consists of 14 Sections with numerous divisions, parts and subsections.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 2 and 4 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

80. Consider the following statements regarding boiler registration and certification under the Indian Boilers Act, 1923 and the Indian Boiler Regulations (IBR), 1950:

1. Every boiler is required to be registered with the Director of Boilers of the concerned State and is assigned a registration number.
2. The Director of Boilers issues a certificate authorizing the use of the boiler for a period of twelve months.
3. For renewal of the certificate, a hydraulic (hydro) test is carried out in the presence of a Boiler Inspector.
4. Based on the report of the Boiler Inspector, the Director of Boilers issues a renewal certificate for another one year in Form VI.

Which of the above statements are correct?

(A) 1 and 2 only
(B) 1, 2 and 3 only
(C) 1, 3 and 4 only
(D) 1, 2, 3 and 4

81. Consider the following statements regarding the repairing procedure of a boiler:

1. Each repair which is carried out on the pressure parts and the parts which affect the satisfactory performance of boiler, prior approval of the concerned IBR authority is taken. Without permission, no repair or alteration can be carried out in a boiler.
2. Damaged boiler components should be replaced only with IBR-approved materials, and welding should be performed by qualified welders using approved procedures.
3. After the completion of repairs, inspection and Non-Destructive Testing (NDT) may be carried out, but a hydraulic test is generally not required.
4. The repaired boiler is inspected and certified before being put back into service.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 2 and 4 only
(C) 1, 3 and 4 only
(D) 1, 2, 3 and 4

82. Consider the following statements regarding Remaining Life Assessment (RLA) of boilers:

1. Remaining Life Assessment (RLA) is carried out to estimate the residual safe operating life of a boiler or its critical components after prolonged service.
2. As per IBR regulation 391A, RLA studies are generally conducted for boilers that have completed about 25 years of service or around 100,000 operating hours, whichever is earlier.
3. RLA includes review of operating history, visual inspection, Non-Destructive Testing (NDT), metallurgical examination and stress analysis of critical components.

Which of the above statements are correct ?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

83. Match the following ASME Boiler and Pressure Vessel Code Sections:

	Section		Rule
1.	Section III	a.	Welding and Brazing Qualifications
2.	Section V	b.	Fibre-Reinforced Plastic Pressure Vessels
3.	Section IX	c.	Non-Destructive Examination (NDE)
4.	Section X	d.	Rules for Construction of Nuclear Facility Components

The correct match is

(A) 1 – d, 2 – c, 3 – a, 4 – b
(B) 1 – c, 2 – d, 3 – b, 4 – a
(C) 1 – d, 2 – a, 3 – c, 4 – b
(D) 1 – b, 2 – c, 3 – a, 4 – d

84. Consider the following statements regarding Section II of the ASME Boiler and Pressure Vessel Code (BPVC):

1. Part A covers ferrous materials, while Part B covers non-ferrous materials.
2. Part C covers welding rods, electrodes and filler metals, whereas Part D provides material properties.
3. Together, the four parts of Section II serve as a service Code to other Sections of the ASME BPVC by providing material specifications for pressure equipment.
4. Part C specifications are designated by SFA numbers and are derived from the American Welding Society (AWS) specifications.

Which of the above statements are correct?

(A) 1 and 2 only
(B) 1, 2 and 3 only
(C) 1, 2, 3 and 4
(D) 2, 3 and 4 only

85. Consider the following statements regarding ISO 16528:

1. ISO 16528 specifies performance requirements for boilers and pressure vessels.
2. ISO 16528 is divided into two parts.
3. ISO 16528-1 specifies the performance requirements for boilers and pressure vessels.
4. ISO 16528-2 sets the rules for daily operation and maintenance.

Which of the statements given above are correct?

(A) 1 and 2 only
(B) 1, 2 and 3 only
(C) 1, 2 and 4 only
(D) 1, 2, 3 and 4

86. Consider the following statements regarding Ultrasonic Testing (UT) of boilers and pressure vessels:

1. Ultrasonic Testing uses high-frequency sound waves to detect discontinuities of a material.
2. If a discontinuity is present, part of the ultrasonic wave is reflected from the defect while the remaining wave continues to the back surface.
3. From the CRT monitor, size, density and location of the discontinuity can be found.
4. This technique is adopted to detect any crack or flaw in the boiler drums, turbine casing, blade, HT bolts, etc.
5. The thickness of a boiler tube cannot be measured with this technique.

Which of the statements given above are correct?

(A) 1, 2 and 4 only

(B) 1, 2, 3 and 4 only

(C) 2, 3, 4 and 5 only

(D) 1, 2, 3, 4 and 5

87. Consider the following statements regarding Shielded Metal Arc Welding (SMAW):

1. Shielded Metal Arc Welding (SMAW), also known as stick welding, is a manual arc welding process that uses a consumable flux-coated electrode.
2. In Shielded Metal Arc Welding (SMAW), either direct current (DC) or alternating current (AC) is used to produce an arc between the flux-coated electrode and the workpiece.
3. SMAW requires an external shielding gas supply during welding.
4. SMAW is widely used for the fabrication and repair of boilers, pressure vessels and pipelines.

Which of the statements given above are correct?

(A) 1 and 2 only

(B) 1, 2 and 4 only

(C) 2, 3 and 4 only

(D) 1, 2, 3 and 4

88. Consider the following statements regarding Tungsten Inert Gas (TIG) Welding:

1. Tungsten Inert Gas (TIG) welding is also known as Gas Tungsten Arc Welding (GTAW).
2. TIG welding uses a non-consumable tungsten electrode to produce the welding arc.
3. An inert gas such as argon or helium is used to shield the weld area from atmospheric contamination.
4. In TIG welding, the tungsten electrode continuously melts and becomes the filler metal.
5. Mostly, S70, S80 and S90 filler rods are used for TIG welding of boiler tubes and pipes.

Which of the statements given above are correct?

(A) 1, 2 and 3 only
(B) 1, 2, 3 and 5 only
(C) 2, 3, 4 and 5 only
(D) 1, 2, 3, 4 and 5

89. Consider the following statements regarding Investment Casting:

1. Investment casting is also known as the lost pattern casting process.
2. In investment casting, an expandable wax pattern is coated with a refractory material to form a mold.
3. The expandable pattern is removed from the dried mold by melting or burning of the pattern.
4. Investment casting is suitable for large, simple-shaped components.

Which of the statements given above are correct?

(A) 1 and 2 only
(B) 1, 2 and 3 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

90. Consider the following statements regarding Rat Tail and Expansion Scab defects in casting:

1. Rat tail is a raised metallic projection formed due to the penetration of molten metal into cracks in the mould surface.
2. Expansion scab is primarily caused by improper pouring temperature and excessive turbulence of molten metal.
3. Expansion scab is mainly caused by the thermal expansion and buckling of the mould surface.
4. Rat tail is mainly caused by inadequate venting of the mould during pouring.

Which of the statements given above is/are correct?

(A) 1 and 2 only
(B) 2 and 4 only
(C) 3 only
(D) 1, 3 and 4 only

91. Consider the following statements regarding weldability of metals:

1. The primary factor affecting the weldability of a base metal is its chemical composition.
2. A metal is considered to have good weldability, if welding can be performed within the required procedural limits and sound welds with satisfactory properties can be fabricated.
3. If the welding procedure limits are narrow, the metal is said to have good weldability.
4. If extraordinary precautions are necessary during welding, the metal is often called unweldable.

Which of the statements given above are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1, 2 and 4 only
(D) 1, 2, 3 and 4

92. Consider the following statements about the rolling operation:

1. Neutral point in rolling operation is also known as no-slip point.
2. Friction acts in opposite directions on the two sides of the neutral point.
3. Hot rolling generally produces a better surface finish than cold rolling.
4. In forward slip, the exit velocity of the strip is greater than the roll surface velocity.

Which of the statements given above are correct?

(A) 1, 2 and 3 only
(B) 1, 2 and 4 only
(C) 1, 3 and 4 only
(D) 1, 2, 3 and 4

93. Consider the following statements about the forging operation:

1. Forging is a metal-forming process in which the workpiece is subjected mainly to compressive forces.
2. Flash is normally removed after forging.
3. Upset forging is commonly used for producing bolt heads.
4. Forging can produce favorable directional grain flow and generally follows the shape of the forged component.

Which of the above statements are correct?

(A) 1, 2 and 3 only
(B) 1, 3 and 4 only
(C) 2, 3 and 4 only
(D) 1, 2, 3 and 4

94. In an SI engine, the combustion

(A) is by laminar flame propagation
(B) causes adiabatic flame temperature
(C) is turbulent flame propagation through a homogeneous mixture of fuel and air
(D) is simultaneous combustion at many points in the combustion chamber

95. Ignition quality of diesel fuel is indicated by its _____.

(A) Flash Point
(B) Cetane Number
(C) Octane Number
(D) Fire Point

96. In a two-stroke petrol engine, the primary function of the crankcase is to

(A) house the transfer port
(B) store lubricating oil
(C) cool the engine
(D) act as a primary pumping chamber for the air-fuel mixture

97. Which of the following devices is used to find the composition of exhaust gases from IC engines?

(A) Bomb calorimeter
(B) Barometer
(C) Rope dynamometer
(D) Orsat apparatus

98. Which of the following actions will help to reduce the black smoke emission of a diesel engine?

1. Run at lower load, i.e. derating
2. Have regular maintenance of the diesel engine, particularly of injection system
3. Use diesel oil of higher cetane number

Select the correct answer using the codes given below.

(A) 1 and 2 only
(B) 1 and 3 only
(C) 2 and 3 only
(D) 1, 2 and 3

99. Which of the following is/are the characteristic/characteristics of Indian coal?

1. High ash content
2. Low sulphur content
3. Low ash fusion temperature

Select the correct answer using the codes given below.

(A) 1 and 2 only
(B) 2 only
(C) 1 and 3 only
(D) 1, 2 and 3

100. The effect of frictional losses in a steam nozzle for the same pressure ratio is to

1. Increase or decrease depending upon the exit quality of the steam
2. Increase the exit velocity from the nozzle
3. Cause no change in the exit velocity from the nozzle
4. Decrease the exit velocity from the nozzle

Which of the above statements is/are correct?

(A) Only 1 and 2 (B) Only 2 and 3

(C) Only 3 (D) Only 4

101. Consider the following statements regarding compounding in steam turbines:

1. In impulse turbine, steam pressure remains constant between ends of the moving blades.
2. In reaction turbine, steam pressure drops from inlet to outlet of the blade.
3. In velocity compounding, partial expansion of steam takes place in the nozzle and further expansion takes place in the rotor blades.

Which of the above statements are CORRECT?

(A) 1 and 2 only

(B) 1 and 3 only

(C) 2 and 3 only

(D) 1, 2 and 3

102. How does throttle governing affect the efficiency of a steam turbine?

(A) Increases efficiency by improving heat recovery

(B) Does not affect efficiency

(C) Increases efficiency by reducing steam pressure drop

(D) Reduces efficiency due to throttling losses

103. The ratio of the power actually delivered by an impeller to the power supplied to the shaft by a prime mover or a motor is called

(A) Overall efficiency (B) Mechanical efficiency

(C) Manometric efficiency (D) Volumetric efficiency

104. Consider the following statements regarding methods of compounding in steam engines:

1. Tandem type compounding of steam engines has the in-line cylinders having pistons mounted on the same piston rod which is further having crosshead and connecting rod providing power output at crankshaft.
2. Woolf compound engine is a cross-type compounding having two cylinders having pistons at 270° phase difference i.e., at some position one cylinder may have piston at inner dead centre and other cylinder has piston at outer dead centre.
3. Receiver compound engine is also a cross compound engine having two cylinders with out of phase pistons and receiver in between.

Which of the above statements are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

105. Which of the following statements are correct?

1. Velocity compounded impulse turbine gives less speed and less efficiency.
2. For an ideal centrifugal compressor, the pressure produced depends on impeller velocity and diameter.
3. While flowing through the rotor blades in a gas turbine, the relative velocity of gas continuously decreases.
4. While flowing through the rotor blades in an axial flow compressor, the relative velocity of air continuously decreases.

(A) 1 and 3 only
(B) 2 and 3 only
(C) 1 and 4 only
(D) 2 and 4 only

106. Steam turbines are governed by the following methods:

1. Throttle governing
2. Nozzle control governing
3. By-pass governing

Which of the above are correct?

(A) Only 1 and 2
(B) Only 2 and 3
(C) Only 1 and 3
(D) 1, 2 and 3

107. The function of a condenser in a thermal power plant is

1. To act as a reservoir to receive steam from the turbine
2. To condense steam into condensate to be reused again
3. To create vacuum

Which of the above statements is/are correct?

(A) Only 1
(B) Only 2 and 3
(C) Only 1 and 3
(D) 1, 2 and 3

108. The following observations are recorded for a steam condenser: condenser vacuum is 680 mm Hg, barometer reading is 760 mm Hg, condenser temperature is 35°C, and saturation pressure of steam at 35°C is 42 mm Hg. What will be the vacuum efficiency of the condenser?

(A) 82.4%
(B) 88.4%
(C) 94.7%
(D) 98.4%

109. In a combined cycle power plant, which of the following is used to generate additional power after the gas turbine?

(A) Nuclear reactor
(B) Steam turbine
(C) Wind turbine
(D) Hydraulic turbine

110. The equivalent evaporation (kg/h) of a boiler producing 2000 kg/h of steam with an enthalpy of 2426 kJ/kg from feedwater at a temperature of 40°C, where the liquid enthalpy is 168 kJ/kg and the enthalpy of vaporisation of water at 100°C is 2258 kJ/kg, is

(A) 1649
(B) 2000
(C) 2149
(D) 1682

111. Which of the following materials is commonly used for constructing superheaters in steam boilers?

(A) Aluminum
(B) Cast iron
(C) Stainless steel
(D) Copper

112. A balanced draught system uses:

1. Steam jet draught
2. Induced draught
3. Forced draught

Which of the above are correct?

(A) Only 1 and 2
(B) Only 1 and 3
(C) Only 2 and 3
(D) 1, 2 and 3

113. Consider the following pairs:

1. Section I – Power Boilers
2. Section IV – Heating Boilers
3. Section V – Non-Destructive Examination
4. Section VII – Welding and Brazing Qualifications

Which of the above pairs are correctly matched?

(A) Only 1 and 2
(B) Only 1, 2 and 3
(C) Only 2, 3 and 4
(D) 1, 2, 3 and 4

114. With reference to steam flow as a measure of boiler rating, consider the following statements:

1. Steam flow represents the amount of steam generated at specified steam outlet pressure and temperature from feedwater supplied at a specified temperature.
2. When reheating is present, the flow of reheated steam must also be considered in evaluating evaporation.
3. For large boilers, steam flow is always a better measure of boiler rating than heat duty.

Which of the above statements is/are correct?

(A) Only 1
(B) Only 2
(C) Only 1 and 2
(D) Only 1 and 3

115. Consider the following statements regarding the methods of calculating boiler efficiency:

1. In the direct method, boiler efficiency is calculated from the gross or net output divided by the total input.
2. The direct method requires accurate measurement of steam flow and fuel flow.
3. In the indirect method, boiler efficiency is calculated by subtracting the ratio of heat loss to heat input from 100 percent.
4. The indirect method requires accurate measurement of steam and fuel flows and is therefore less accurate than the direct method.

Which of the above statements are correct?

(A) Only 1 and 2 (B) Only 1 and 3

(C) Only 1, 2 and 3 (D) 1, 2, 3 and 4

116. Which of the following is an advantage of the direct method of determining boiler efficiency?

(A) It identifies individual heat losses in the boiler

(B) It requires detailed flue-gas analysis

(C) It requires fewer measurements and instruments

(D) It provides the cause of efficiency losses directly

117. Consider the following statements regarding boiler testing:

1. Routine testing is generally less rigorous, less time-consuming, and less expensive than acceptance testing.
2. Acceptance testing is carried out with third-party involvement, and its results may be used for commercial settlements.
3. Routine testing involves statutory third-party participation.
4. Acceptance testing is performed only when a boiler is initially purchased.

Which of the above statements are correct?

(A) Only 1 and 2 (B) Only 1 and 3

(C) Only 2 and 4 (D) 1, 2 and 3

118. Which of the following statements correctly distinguishes Pulverised Fuel (PF) Firing from Circulating Fluidised Bed Combustion (CFBC)?

(A) PF firing has higher fuel flexibility and better multi-fuel firing capability than CFBC.

(B) PF-fired boilers generally have a combustion efficiency exceeding 99%, but are inferior to CFBC in fuel flexibility and multi-fuel firing capability.

(C) PF firing permits in-furnace sulphur capture and produces lower NO_x emissions than CFBC.

(D) CFBC is generally preferred over PF firing in large utility boilers burning normal coal because of its higher combustion efficiency.

119. In oil refineries, carbon monoxide (CO) boilers are primarily employed when

(A) The flue gases contain little or no CO

(B) The flue gases are rich in CO due to regeneration with low excess air

(C) The catalyst regeneration process is carried out with excess air

(D) Only sensible heat of the flue gases needs to be recovered

120. Consider the following statements regarding excess air in boiler combustion:

1. Excess air is the amount of air supplied beyond the theoretical air required for complete combustion.
2. Increasing excess air beyond the optimum level increases stack losses.
3. Reducing excess air below the required level increases unburnt losses.
4. The optimum excess air is generally determined during actual boiler operation.

Which of the above statements are correct?

(A) Only 1 and 2 (B) Only 2 and 3

(C) Only 1, 2 and 3 (D) 1, 2, 3 and 4

121. During inspection of a boiler pressure part, ultrasonic thickness measurement is primarily used to detect

(A) Internal combustion instability

(B) Reduction in wall thickness due to corrosion or erosion

(C) Improper fuel–air ratio

(D) Excessive steam temperature

122. Consider the following statements regarding a boiler safety valve:

1. It protects the boiler against excessive pressure.
2. It should be capable of releasing steam when the pressure exceeds its set pressure.
3. Its operation can be replaced by controlling the firing rate alone.
4. Its setting is an important part of boiler safety.

Which of the above statements are correct?

(A) Only 1 and 2
(B) Only 1, 2 and 4
(C) Only 2 and 3
(D) 1, 2, 3 and 4

123. Consider the following statements regarding boiler tube failure analysis:

1. The location and morphology of the failed tube are useful in identifying the failure mechanism.
2. Metallographic examination can provide evidence of overheating and microstructural changes.
3. Examination of deposits on the tube surface may help identify the cause of overheating.
4. Visual examination alone is always sufficient to establish the root cause of tube failure.

Which of the above statements are correct?

(A) Only 1 and 2
(B) Only 1, 2 and 3
(C) Only 2, 3 and 4
(D) 1, 2, 3 and 4

124. Which of the following is the most significant consequence of excessive scale formation on the water side of boiler tubes?

(A) Increased heat transfer and reduced tube temperature
(B) Reduced heat transfer causing higher tube-metal temperature
(C) Increased circulation and reduced pressure drop
(D) Reduced flue-gas temperature due to improved heat transfer

125. A boiler tube shows pronounced deformation, significant wall thinning and evidence of prolonged exposure to high temperature. Which combination of mechanisms is most relevant for failure analysis?

(A) Overheating and creep-related damage
(B) Low-temperature corrosion only
(C) Thermal insulation improvement and reduced heat flux
(D) Increased water circulation and reduced metal temperature

126. Which of the following best represents the objective of condition-based maintenance of boiler pressure parts?

(A) Replacing all components at fixed intervals irrespective of condition

(B) Monitoring equipment condition to identify developing defects and plan maintenance before failure

(C) Operating the boiler until complete failure occurs

(D) Eliminating the need for periodic inspection

127. Consider the following statements regarding boiler maintenance:

1. Preventive maintenance is performed on a regular schedule to prevent damage to equipment or systems.
2. Predictive maintenance involves monitoring, examinations and tests to identify problems that may eventually cause failure.
3. Breakdown maintenance requires expenditure on preventive activities before failure occurs.
4. Water treatment and lubrication are identified as principal preventive maintenance activities in a boiler plant.

Which of the above statements are correct?

(A) Only 1 and 2

(B) Only 1, 2 and 4

(C) Only 2 and 3

(D) 1, 2, 3 and 4

128. The primary maintenance significance of proper boiler-water treatment is to

(A) Prevent corrosion and scale formation that can lead to expensive or catastrophic failure

(B) Increase mechanical friction between moving components

(C) Eliminate the need for predictive maintenance

(D) Increase the probability of boiler failure so that defects can be identified early

129. Why is hydrostatic testing generally safer than pneumatic testing for pressure-containing equipment?

(A) Water stores substantially more expansion energy than compressed air

(B) Water pressure drops rapidly when containment fails, whereas compressed air can expand violently

(C) Hydrostatic testing does not require pressure monitoring

(D) Pneumatic testing cannot detect leakage

130. Consider the following statements regarding a soundness test during hydrostatic testing of a boiler:

1. The pressure source should be disconnected during the observation period of the soundness test.
2. The pressure should be observed for a specified period to check for leakage.
3. The pressure source should remain connected throughout the observation period to compensate for any pressure loss.
4. Compressed-air testing is preferred because it is safer than hydrostatic testing in the event of rupture.

Which of the above statements are correct?

(A) Only 1 and 2
(B) Only 1, 2 and 3
(C) Only 2 and 4
(D) 1, 2, 3 and 4

131. Which of the following is the most appropriate long-term approach for repairing a deteriorated section of boiler refractory?

(A) Repeatedly applying a thin surface coating over the existing refractory
(B) Completely replacing the affected section with adequate provision for expansion
(C) Leaving the damaged section untreated until complete failure
(D) Increasing the operating temperature to bond the old and new refractory

132. Consider the following statements regarding pressure and draft gauges in a boiler plant:

1. Gauge calibration should be checked periodically to maintain accurate and reliable readings.
2. A gauge showing constant needle movement may require more frequent checking.
3. Sensing lines require attention because they can become contaminated or obstructed.
4. Draft gauges should be checked for zero whenever the boiler is shut down.

Which of the above statements are correct?

(A) Only 1 and 2
(B) Only 1, 2 and 3
(C) Only 2, 3 and 4
(D) 1, 2, 3 and 4

133. Consider the following statements regarding boiler-plant insulation maintenance:

1. Damaged or compressed insulation should be replaced.
2. Missing insulation increases energy loss and can create a burn hazard.
3. Wet insulation that has collapsed should generally be replaced.
4. Insulation removed during maintenance or repair should be restored or replaced.

Which of the above statements are correct?

(A) Only 1 and 2

(B) Only 1, 2 and 4

(C) Only 2, 3 and 4

(D) 1, 2, 3 and 4

134. Consider the following statements regarding Residual Life Assessment (RLA) of boilers:

1. RLA involves assessing the condition of critical boiler components to estimate their remaining service life and identify components requiring attention.
2. RLA is limited only to components that have already failed during operation.
3. The thickness and surface condition of affected pressure parts can be assessed to determine the extent of deterioration and the rate of material loss.
4. Repair or replacement of components may be undertaken based on the findings of RLA.

Which of the above statements are correct?

(A) Only 1 and 2

(B) Only 1, 3 and 4

(C) Only 2 and 3

(D) 1, 2, 3 and 4

135. Which of the following best describes the appropriate sequence for boiler life extension near the end of its nominal design life?

(A) Replacement of the entire boiler $\rightarrow$ RLA $\rightarrow$ routine operation

(B) RLA study $\rightarrow$ necessary repair and replacement $\rightarrow$ operation for the extended period

(C) Routine maintenance $\rightarrow$ increase operating pressure $\rightarrow$ RLA

(D) Hydrostatic testing $\rightarrow$ immediate disposal $\rightarrow$ replacement boiler

136. Consider the following statements regarding the design life of boiler components:

1. Boilers are generally designed for a nominal life of about 30 years.
2. High-temperature components such as superheaters, reheaters and associated headers are governed by creep strength.
3. High-temperature components are generally designed for the same 30-year life as the complete boiler.
4. Such high-temperature components may be replaced to provide another period of service.

Which of the above statements are correct?

(A) Only 1 and 2
(B) Only 1, 2 and 4
(C) Only 2 and 3
(D) 1, 2, 3 and 4

137. Post-Weld Heat Treatment (PWHT) of boiler pressure parts is carried out to:

1. Relieve residual stresses
2. Improve ductility
3. Prevent cracking

Which of the above is/are correct?

(A) Only 1
(B) Only 1 and 2
(C) Only 2 and 3
(D) 1, 2 and 3

138. In welding of boiler pressure parts, the region of the base metal adjacent to the weld that undergoes microstructural changes due to welding heat but does not melt is called

(A) Fusion zone
(B) Heat-affected zone
(C) Weld metal
(D) Root zone

139. Consider the following statements regarding furnace explosion:

1. Accumulation of unburnt fuel in the furnace or hot gas path is a major cause.
2. Introduction of fuel without sufficient ignition energy can contribute to furnace explosion.
3. An explosive mixture of unburnt fuel and air can cause an explosion in a confined space.
4. Furnace explosion is primarily caused by excessive feedwater supply.

Which of the above statements are correct?

(A) Only 1 and 2
(B) Only 1, 2 and 3
(C) Only 2, 3 and 4
(D) 1, 2, 3 and 4

140. Which of the following statements is INCORRECT about the high-pressure and low-water safety alarm in a steam boiler?

(A) The high-pressure and low-water safety alarm is a safety mounting against high pressure and low-water levels.

(B) The high-pressure and low-water safety alarm is suitable for a locomotive boiler.

(C) The high-pressure and low-water safety alarm operates with loud noise.

(D) The high-pressure and low-water safety alarm has two valves.

141. The function of which of the following boiler accessories is to recover some of the heat carried away in the flue gases up the chimney and utilize for heating the feedwater to the boiler?

(A) Injector

(B) Superheater

(C) Air preheater

(D) Economiser

142. Consider the following statements regarding the visibility of indications in a Dye Penetration Test:

1. The penetrant may contain a dye for observation under white light.
2. A fluorescent material may be used for observation under suitable ultraviolet light.
3. The penetrant that has entered a crack remains invisible unless the component is magnetised.
4. The penetrant within the crack can be drawn back onto the base liquid to produce a visible indication.

Which of the above statements are correct?

(A) Only 1 and 2

(B) Only 2 and 3

(C) Only 1, 2 and 4

(D) 1, 2, 3 and 4

143. Consider the following statements regarding Non-Destructive Testing (NDT) in power plants:

1. NDT methods allow the condition of components to be evaluated without destroying the component.
2. NDT can help detect minor abnormalities before they develop into equipment failure.
3. NDT is applied only to boilers because turbines are subjected mainly to mechanical stress.
4. Boiler, turbine and steam pipeline components can be examined using NDT techniques.

Which of the above statements are correct?

(A) Only 1 and 2

(B) Only 2 and 3

(C) Only 1, 2 and 4

(D) 1, 2, 3 and 4

144. Which type of boiler valve is designed to automatically open when the pressure exceeds its set pressure and reseat automatically when the pressure falls below the blowdown pressure?

(A) Safety valve
(B) Check valve
(C) Rising-stem valve
(D) Needle valve

145. Which of the following is the primary purpose of a Sankey diagram in energy-system analysis?

(A) To calculate the pressure drop across a steam turbine
(B) To determine the chemical composition of the fuel
(C) To represent energy or heat flows and losses in a system
(D) To determine the temperature profile of a furnace

146. Which of the following is the primary purpose of purging a boiler furnace before start-up?

(A) To increase the steam pressure rapidly
(B) To remove accumulated combustible gases or unburnt fuel from the furnace
(C) To increase the concentration of fuel in the furnace
(D) To reduce the water level in the steam drum

147. The primary purpose of lock-out/tag-out (LOTO) during boiler maintenance is to

(A) Prevent unexpected energisation or release of hazardous energy
(B) Increase the operating pressure of the boiler before maintenance
(C) Maintain the boiler in normal firing condition during maintenance
(D) Increase the speed of maintenance activities

148. Consider the following statements regarding work inside a boiler as a confined-space activity:

1. The space should be properly isolated before entry.
2. Atmospheric conditions should be assessed before and during entry as required.
3. A permit-to-work system can be used to control and authorise the work.
4. Entry can be permitted without considering hazardous energy sources if the boiler is not firing.

Which of the above statements are correct?

(A) Only 1 and 2
(B) Only 1, 2 and 3
(C) Only 2 and 4
(D) 1, 2, 3 and 4

149. Which of the following is the main purpose of a permit-to-work system for entry into a boiler confined space?

(A) Increase boiler operating efficiency

(B) Control and authorise hazardous work

(C) Reduce boiler fuel consumption

(D) Increase steam production

150. Consider the following statements regarding the primary functions of a Burner Management System (BMS):

1. It supervises burner operation to ensure that operating parameters remain within specified limits.
2. It supervises the procedures required to place the boiler and burner into operation.
3. It may provide a controlled shutdown of the boiler and burner(s).
4. Its primary function is to regulate the steam pressure during normal boiler operation.

Which of the above statements are correct?

(A) Only 1 and 2 (B) Only 2 and 4

(C) Only 1, 2 and 3 (D) 1, 2, 3 and 4

151. Consider the following statements regarding NO_x generation in fossil-fuel combustion:

1. NO_x formation is associated with the presence of nitrogen and oxygen under combustion conditions.
2. NO_x formation can involve oxidation of nitrogen present in the fuel as well as nitrogen present in combustion air.
3. Nitrous oxide (N_2O) is included in the conventional NO_x emission measurement reported for boiler flue gases.
4. NO_x formation is completely independent of combustion temperature.

Which of the above statements are correct?

(A) Only 1 and 2 (B) Only 2 and 3

(C) Only 1, 2 and 4 (D) 1, 2, 3 and 4

152. Consider the following statements regarding Low-NO_x Burners (LNBs):

1. LNBs can stage the mixing of fuel and air to prolong the combustion process.
2. LNB operation can reduce peak flame temperature.
3. LNBs can reduce oxygen concentration during some phases of combustion.
4. LNBs increase NO_x formation by deliberately increasing the peak flame temperature.

Which of the above statements are correct?

(A) Only 1 and 2 (B) Only 1, 2 and 3

(C) Only 3 and 4 (D) 1, 2, 3 and 4

153. Consider the following statements regarding Separated Overfire Air (SOFA):
1. SOFA diverts a portion of combustion air from the main combustion zone.
2. The diverted air is injected into the upper furnace above the normal combustion zone.
3. The main burners consequently operate under relatively air-starved conditions.
4. SOFA prevents completion of combustion by withholding air from the upper furnace.

Which of the above statements are correct?

(A) Only 1 and 2
(B) Only 2 and 3
(C) Only 1, 2 and 3
(D) 1, 2, 3 and 4

154. Which of the following correctly distinguishes SNCR from SCR?

(A) SNCR uses a reducing agent without a catalyst, while SCR uses a reducing agent with a catalyst.
(B) SNCR uses a catalyst, while SCR does not.
(C) Both SNCR and SCR require a catalyst.
(D) Neither SNCR nor SCR uses a reducing agent.

155. Consider the following statements regarding carbon monoxide (CO) in boiler flue gas:
1. CO is formed when fuel burns with insufficient oxygen.
2. Presence of CO in flue gas indicates incomplete combustion.
3. Incomplete combustion associated with CO formation can reduce boiler efficiency.
4. Formation of CO is desirable because it indicates effective utilization of fuel.

Which of the above statements are correct?

(A) Only 1 and 2
(B) Only 1, 2 and 3
(C) Only 2 and 4
(D) 1, 2, 3 and 4

156. Consider the following statements regarding sulphur oxides (SO_x) formation during fossil-fuel combustion:
1. Sulphur present in fuel is oxidised during combustion to form sulphur oxides.
2. Sulphur dioxide (SO_2) is an objectionable component of flue gas.
3. Use of low-sulphur fuel can help reduce SO_x formation.
4. Chemically bound sulphur in coal can always be completely removed by coal washing.

Which of the above statements are correct?

(A) Only 1, 2 and 3
(B) Only 1 and 2
(C) Only 2 and 4
(D) 1, 2, 3 and 4

157. Which of the following correctly describes Flue-Gas Desulphurisation (FGD)?

(A) FGD removes sulphur from the fuel before combustion.

(B) FGD is a post-combustion process used to reduce SO_x emissions from flue gas.

(C) FGD is primarily used to remove particulate matter from flue gas.

(D) FGD increases the concentration of SO_x in the flue gas.

158. Consider the following statements regarding mercury emissions from power plants:

1. Mercury may occur in elemental, oxidised and particulate-associated forms.
2. Elemental mercury can remain in the atmosphere for a relatively long period.
3. Activated carbon can be injected into flue gas to capture mercury.
4. The activated carbon containing captured mercury can be collected using a fabric filter.

Which of the above statements are correct?

(A) Only 1 and 2

(B) Only 1, 2 and 3

(C) Only 2, 3 and 4

(D) 1, 2, 3 and 4

159. Which of the following is the main purpose of a cyclone separator in a boiler?

(A) To remove particulate matter from flue gas

(B) To remove SO_x from flue gas

(C) To remove NO_x from flue gas

(D) To reduce carbon dioxide emissions

160. Consider the following statements regarding single-element drum-level control:

1. Single-element feedwater control uses boiler water level as the process variable.
2. A sudden increase in boiler load can cause swell, resulting in an apparent rise in water level without additional water being added.
3. During swell, a single-element controller tends to open the feedwater valve to compensate for the increased load.

Which of the above statements is/are correct?

(A) Only 1

(B) Only 1 and 2

(C) Only 2 and 3

(D) 1, 2 and 3

161. Consider the following statements regarding three-element drum-level control:

1. Feedwater flow is measured as an additional process variable.
2. The feedwater flow controller adjusts the feedwater control valve.
3. Three-element control is particularly useful when feedwater pressure is frequently changing or heavy load swings occur.

Which of the above statements are correct?

(A) Only 1 and 2
(B) Only 2 and 3
(C) Only 1 and 3
(D) 1, 2 and 3

162. Consider the following statements regarding combustion or firing-rate control:

1. Firing-rate controls regulate the flow of fuel and combustion air to the burner.
2. Maintaining an appropriate air-to-fuel ratio is important for safe and efficient boiler operation.
3. The control of combustion air is unnecessary when fuel flow is being controlled.

Which of the above statements is/are correct?

(A) Only 1
(B) Only 1 and 2
(C) Only 2 and 3
(D) 1, 2 and 3

163. Which of the following is an example of digitalisation in a modern boiler plant?

(A) IoT-based condition monitoring
(B) Manual reading of a gauge glass
(C) Manual adjustment of a valve
(D) Periodic visual inspection only

164. Consider the following statements regarding temperature transmitters:

1. A temperature transmitter is preferred for transmitting weak thermocouple or RTD signals with reduced disturbance.
2. The transmitter converts the low-level sensor signal into a higher-level analog signal suitable for interfacing with an indicator, recorder or DCS/PLC.
3. A 4 – 20 mA signal can be used as the output signal from the temperature transmitter to the control device.

Which of the above statements are correct?

(A) 1 and 2 only
(B) 2 and 3 only
(C) 1 and 3 only
(D) 1, 2 and 3

165. Consider the following statements regarding a closed-loop control system:

1. The measured process output is used as feedback to the controller.
2. The controller compares the feedback with the setpoint and initiates corrective action when there is a deviation.
3. The difference between the setpoint and feedback is called the error signal.

Which of the above statements are correct?

(A) Only 1 and 2
(B) Only 2 and 3
(C) Only 1 and 3
(D) 1, 2 and 3

166. Consider the following statements regarding PLC and DCS in power-plant automation:

1. PLC and DCS can be used for process control and automation in power plants.
2. PID control functions can be implemented in PLC and DCS systems.
3. PLC and DCS are used only for displaying measured process parameters and cannot perform control functions.

Which of the above statements is/are correct?

(A) Only 1
(B) Only 1 and 2
(C) Only 2 and 3
(D) 1, 2 and 3

167. Consider the following statements regarding pneumatic control valves:

1. An air-to-close valve remains open in the absence of compressed air supply.
2. An air-to-open valve closes when the compressed-air supply fails.
3. The choice between air-to-open and air-to-close depends on the required fail position and safety requirements.

Which of the above statements are correct?

(A) Only 1 and 2
(B) Only 1 and 3
(C) Only 2 and 3
(D) 1, 2 and 3

168. Which of the following best distinguishes a digital twin from conventional plant monitoring?

(A) A digital twin only displays real-time sensor readings, whereas conventional monitoring performs analysis

(B) A digital twin provides a digital representation of the physical system that can be used for analysis, simulation and performance assessment

(C) A digital twin operates independently of data from the physical plant

(D) A digital twin is primarily a physical replica used for emergency operation

169. In AI/ML-based predictive maintenance of boiler equipment, the availability of historical operating and condition data is important mainly because it

(A) Allows the model to identify patterns associated with equipment degradation and potential failure

(B) Ensures that every equipment failure can be predicted with certainty

(C) Removes the need for real-time sensor measurements

(D) Allows safety interlocks to be bypassed during abnormal operation

170. In an IoT-based condition-monitoring system for a boiler plant, the sequence that most appropriately represents the basic data flow is

(A) Sensor → Data acquisition → Communication/processing → Condition assessment

(B) Sensor → Actuator → Data acquisition → Condition assessment

(C) Data acquisition → Sensor → Actuator → Condition assessment

(D) Condition assessment → Sensor → Data acquisition → Communication

171. Which of the following is a significant limitation of AI/ML-based predictive maintenance in a boiler plant?

(A) Its effectiveness depends on the quality, relevance and availability of historical and real-time operating data

(B) It can be implemented effectively without sensors because equipment condition can be inferred directly from maintenance schedules

(C) It is limited to detecting faults only after equipment failure has occurred

(D) It cannot be used for performance optimisation because AI/ML models are restricted to safety-related applications

172. Consider the following statements regarding the benefits and limitations of automation in boiler operation:

1. Automated control can reduce operational variability by continuously adjusting process variables in response to changes in boiler load.
2. Automation can contribute to emission compliance by maintaining combustion conditions within an appropriate operating range; however, compliance cannot be ensured solely by the presence of an automatic control system.
3. Dependence on sensors, actuators and control logic introduces failure modes that may adversely affect boiler safety or performance if these elements are faulty or improperly maintained.
4. A higher degree of automation necessarily reduces the need for operator knowledge because abnormal conditions can always be identified and corrected automatically.

Which of the above statements are correct?

(A) Only 1 and 2

(B) Only 1 and 3

(C) Only 1, 2 and 3

(D) 1, 2, 3 and 4

173. Consider the following statements regarding SCADA in a boiler plant:

1. SCADA can provide operators with centralized visualization of process variables, alarms and equipment status.
2. SCADA systems can acquire process data from PLCs and other field/control devices for supervisory monitoring.
3. SCADA necessarily performs all fast, safety-critical control actions directly at the supervisory level.
4. Historical data and trends available through SCADA can assist in analysing plant performance and operating conditions.

Which of the above statements are correct?

(A) Only 1 and 2

(B) Only 1, 2 and 4

(C) Only 2 and 3

(D) 1, 2, 3 and 4

174. Under the Boilers Act, 2025, which of the following is not excluded from the definition of a "boiler"?

(A) A pressure vessel having a capacity of less than 25 litres

(B) A pressure vessel having less than 1 kg/cm^2 design gauge pressure and working gauge pressure

(C) A vessel in which water is heated below 100°C

(D) A pressure vessel in which steam is generated for use external to itself by application of heat

175. Consider the following statements regarding "boiler components":

1. An economiser is included within the boiler components.
2. A superheater is included within the boiler components.
3. A component is covered only if it is an internal part of a boiler.

Which of the above statements is/are correct?

(A) Only 1

(B) Only 1 and 2

(C) Only 2 and 3

(D) 1, 2 and 3

176. Which one of the following correctly describes the composition of the Central Boilers Board?

(A) It consists exclusively of representatives of State Governments.

(B) It includes representatives of the Central Government, BIS, boiler manufacturers, national laboratories, engineering consultancy agencies and boiler users.

(C) It consists only of officers appointed by the Central Government.

(D) It consists exclusively of Inspectors appointed by the State Governments.

177. Consider the following statements regarding welders' certification:

1. The competent authority is an institution recognised in the manner specified by regulations.
2. A person intending to undertake welding work connected with a boiler or boiler component must apply for the specified welders' certificate.
3. The competent authority may refuse the certificate without giving the applicant an opportunity of being heard.

Which of the above statements is/are correct?

(A) Only 1

(B) Only 1 and 2

(C) Only 2 and 3

(D) 1, 2 and 3

178. Before the manufacture of a boiler or boiler component can commence, which of the following is not expressly prescribed as a condition under Section 7?

(A) Specified facilities for design and construction at the manufacturing premises

(B) Certificate for the design and drawings from the inspecting authority

(C) Use of materials, mountings and fittings conforming to specified specifications

(D) Prior registration of the boiler by the Chief Inspector

179. An owner intending to register a boiler under the Boilers Act, 2025 is required to engage an inspecting authority for inspection at which stage?

(A) Design

(B) Manufacture

(C) Erection

(D) Renewal

180. Consider the following statements regarding repair of boilers:

1. Welding work must be performed by persons holding a welders' certificate.
2. A user without in-house repair facilities must engage a boiler repairer possessing a boiler repairer certificate.
3. A competent person is required for approval of repairs carried out in-house or by repairers.
4. Safety of persons working inside a boiler is specifically addressed.

Which of the above statements are correct?

(A) Only 1 and 2 (B) Only 2 and 3

(C) Only 1, 2 and 3 (D) 1, 2, 3 and 4

181. Which of the following is not a condition imposed under Section 11 for use of a boiler?

(A) The boiler must be registered.

(B) Transfer of a boiler from one state to another must have been reported in the prescribed manner.

(C) The owner must possess the certificate or provisional order authorising use.

(D) The boiler must necessarily be operated at its maximum authorised pressure.

182. An application for registration of an unregistered boiler is made to

(A) Chief Inspector

(B) Inspector

(C) Central Boilers Board

(D) Technical Adviser

183. After registration of a boiler, the certificate authorising its use is ordinarily granted for a period

(A) Not exceeding six months

(B) Not exceeding twelve months

(C) Not exceeding eighteen months

(D) Not exceeding twenty-four months

184. Consider the following statements regarding repeal and savings under the Boilers Act, 2025:

1. The Boilers Act, 1923 is repealed.
2. Notifications, rules, regulations, bye-laws, orders and exemptions made under the repealed Act continue to have effect until replaced under the new Act.
3. A boiler registered under the repealed Act is deemed to have been registered under the Boilers Act, 2025.
4. The Board constituted under the repealed Act continues to function until a new Board is constituted under the 2025 Act.

Which of the above statements are correct?

(A) Only 1 and 2

(B) Only 1, 2 and 3

(C) Only 2, 3 and 4

(D) 1, 2, 3 and 4

185. Which of the following combinations is correctly matched?

1. Section 27 – Minor penalties
2. Section 28 – Penalties for illegal use of boiler
3. Section 29 – Punishment for certain offences
4. Section 30 – Penalty for tampering with register mark

Select the correct answer:

(A) Only 1 and 2 (B) Only 2 and 3

(C) Only 1, 3 and 4 (D) 1, 2, 3 and 4

186. If an accident occurs to a boiler or boiler component, the owner or person in charge must report it in writing to the Inspector within

(A) 12 hours (B) 24 hours

(C) 48 hours (D) 72 hours

187. Under the Boilers Act, 2025, penalties, fines and costs levied under the Act are recoverable as

(A) Arrears of land revenue

(B) Court fees

(C) Government loans

(D) Property tax

188. With reference to the Central Boilers Board constituted under the Boilers Act, 2025, which one of the following statements is incorrect?

(A) The Secretary to the Government of India in charge of the Department having administrative control of the Board is its ex officio Chairperson.

(B) One member represents each State, other than Union Territories, and is nominated by the respective State Government.

(C) The Technical Advisor is the ex officio Member-Secretary of the Board.

(D) The Board ceases to exercise its powers whenever a vacancy occurs among its members.

189. Which of the following boilers is not excluded from the application of the Boilers Act, 2025?

(A) A locomotive boiler belonging to or under the control of the Railways.

(B) A boiler belonging to or under the control of the Indian Navy.

(C) A boiler forming a part of a hospital sterilizer having a capacity of 80 litres.

(D) A boiler belonging to a State Government.

190. Under the Boilers Act, 2025, which one of the following correctly describes the procedure following an application for registration of a boiler?

(A) The Inspector must examine the boiler within fifteen days and submit the report to the State Government within three days.

(B) The Inspector fixes the examination date within thirty days, gives the owner at least ten days' notice, and forwards the inspection report to the Chief Inspector within seven days of inspection.

(C) The Chief Inspector fixes the examination date within thirty days and directly issues the registration certificate after receiving the prescribed fee.

(D) The Inspector may register the boiler after confirming that it has suffered no damage during transportation.

191. Consider the following provisions of the Boilers Act, 2025:

1. Power of Central Government to give directions
2. Exemptions
3. Power of Central Government to make rules
4. Power of Board to make regulations

Which of the following correctly represents the corresponding sequence of Sections?

(A) 37, 38, 39, 40
(B) 36, 37, 38, 39
(C) 38, 39, 40, 41
(D) 37, 39, 40, 41

192. With reference to supervision of boiler operation under the Boiler Operation Engineers' Rules, 2025, consider the following statements:

1. The requirement of a proficient person applies where the total heating surface exceeds 1,000 m^2 in the cases specified under Rule 3.
2. Boilers situated within a radius of 50 metres are considered together for determining the applicability of the requirement.
3. The Chief Inspector may permit a boiler attendant to remain in charge for a maximum period of six months.

Which of the above statements are correct?

(A) Statements 1 and 2 are correct
(B) Statements 1 and 3 are correct
(C) Statements 2 and 3 are correct
(D) All the three statements are correct

193. Under the Boiler Operation Engineers' Rules, 2025, a person holding a Certificate of Proficiency is authorised to

(A) Manufacture boiler pressure parts
(B) Be in charge of boilers of any type and size
(C) Register boilers with the Central Boilers Board
(D) Certify boiler welders

194. Which one of the following correctly describes the validity of a Certificate of Proficiency as a Boiler Operation Engineer under the 2025 Rules?

(A) It is valid only in the State in which it was issued and expires at 60 years.

(B) It is valid throughout India and remains valid until the holder attains 65 years of age, subject to the prescribed intimation requirement when applying for service or changing State.

(C) It is valid throughout India but must be renewed every five years.

(D) It is valid for lifetime of the holder, irrespective of age or change of State.

195. Under the Boiler Attendants' Rules, 2025, a candidate for a Second Class Boiler Attendant Certificate must be at least

(A) 18 years (B) 20 years

(C) 21 years (D) 22 years

196. A Boiler Attendant's Certificate of Competency issued under the Boiler Attendants' Rules, 2025 is valid until the certificate holder attains the age of

(A) 60 years (B) 62 years

(C) 65 years (D) 70 years

197. Under the Gujarat Economiser Rules, provision is made for maintaining a register of economisers. The register is required to be maintained by

(A) The owner of the economiser

(B) The Chief Inspector

(C) The manufacturer of the economiser

(D) The District Magistrate

198. Under the Gujarat Boiler Rules, 1966, the Chief Inspector works under the administrative control of

(A) Commissioner of Industries

(B) Commissioner of Labour, Gujarat

(C) Secretary, Education Department

(D) Director of Technical Education

199. Which of the following is not specifically required to be maintained by the Chief Inspector under Rule 9?

(A) Register of appeals

(B) Register of accidents

(C) Register of registration and inspection fees received

(D) Register of complaints against boiler manufacturers

200. Under the Gujarat Boiler Rules, 1966, the main duties of Inspectors include the inspection and examination of:

1. Boilers

2. Steam-pipes

3. Economisers

Which of the above statements is/are correct?

(A) Only 1 (B) Only 1 and 3

(C) Only 2 and 3 (D) 1, 2 and 3
