Inspector factory & Boilers Screening test - 2020

पुस्तिका में पृष्ठों की संख्या : 32
Number of Pages in Booklet : 32

पुस्तिका में प्रश्नों की संख्या : 180
No. of Questions in Booklet : 180

Paper Code : 03

BFI-02

प्रश्न-पत्र पुस्तिका संख्या /
Question Paper Booklet No. **8014897**

Exam date :- 25/11/2020
Time = 10.00 AM to 01.00 PM

समय : 3.00 घण्टे
Time : 3.00 Hours

अधिकतम अंक : 180
Maximum Marks : 180

प्रश्न-पत्र पुस्तिका एवं उत्तर पत्रक के पेपर सील/पॉलिथीन बैग को खोलने पर परीक्षार्थी यह सुनिश्चित कर लें कि उसके प्रश्न-पत्र पुस्तिका पर वही प्रश्न-पत्र पुस्तिका संख्या अंकित है जो उत्तर पत्रक पर अंकित है । इसमें कोई भिन्नता हो, तो परीक्षार्थी वीक्षक से दूसरा प्रश्न-पत्र प्राप्त कर लें । ऐसा सुनिश्चित करने की जिम्मेदारी अभ्यर्थी की होगी ।
On opening the paper seal/polythene bag of the Question Paper Booklet the candidate should ensure that Question Paper Booklet No. of the Question Paper Booklet and Answer Sheet must be same. If there is any difference, candidate must obtain another Question Paper Booklet from Invigilator. Candidate himself shall be responsible for ensuring this.

परीक्षार्थियों के लिए निर्देश	INSTRUCTIONS FOR CANDIDATES
1. सभी प्रश्नों के उत्तर दीजिए ।	1. Answer all questions.
2. सभी प्रश्नों के अंक समान हैं ।	2. All questions carry equal marks.
3. प्रत्येक प्रश्न का केवल **एक ही** उत्तर दीजिए ।	3. Only **one** answer is to be given for each question.
4. एक से अधिक उत्तर देने की दशा में प्रश्न के उत्तर को गलत माना जाएगा ।	4. If more than one answers are marked, it would be treated as wrong answer.
5. प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं, जिन्हें क्रमश: 1, 2, 3, 4 अंकित किया गया है । अभ्यर्थी को सही उत्तर निर्दिष्ट करते हुए उनमें से केवल एक गोले अथवा बबल को उत्तर पत्रक पर **नीले बॉल प्वाइंट पेन** से गहरा करना है ।	5. Each question has four alternative responses marked serially as **1, 2, 3, 4**. You have to darken only one circle or bubble indicating the correct answer on the Answer Sheet using **BLUE BALL POINT PEN**.
6. OMR उत्तर पत्रक इस परीक्षा पुस्तिका के अन्दर रखा है । जब आपको परीक्षा पुस्तिका खोलने को कहा जाए, तो उत्तर-पत्रक निकाल कर ध्यान से केवल **नीले बॉल प्वाइंट पेन** से विवरण भरें ।	6. The **OMR** Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars carefully with **blue ball point pen** only.
7. प्रत्येक गलत उत्तर के लिए प्रश्न अंक का 1/3 भाग काटा जायेगा । गलत उत्तर से तात्पर्य अशुद्ध उत्तर अथवा किसी भी प्रश्न के एक से अधिक उत्तर से है । किसी भी प्रश्न से संबंधित गोले या बबल को खाली छोड़ना गलत उत्तर नहीं माना जायेगा ।	7. **1/3 part of the mark(s) of each question will be deducted for each wrong answer.** A wrong answer means an incorrect answer or more than one answers for any question. Leaving all the relevant circles or bubbles of any question blank will not be considered as wrong answer.
8. मोबाइल फोन अथवा इलेक्ट्रॉनिक यंत्र का परीक्षा हॉल में प्रयोग पूर्णतया वर्जित है । यदि किसी अभ्यर्थी के पास ऐसी कोई वर्जित सामग्री मिलती है तो उसके विरुद्ध आयोग द्वारा नियमानुसार कार्यवाही की जायेगी ।	8. Mobile Phone or any other electronic gadget in the examination hall is strictly prohibited. A candidate found with any of such objectionable material with him/her will be strictly dealt as per rules.
9. कृपया अपना रोल नम्बर ओ.एम.आर. पत्रक पर सावधानीपूर्वक सही भरें । गलत अथवा अपूर्ण रोल नम्बर भरने पर **5 अंक** कुल प्राप्तांकों में से काटे जा सकते हैं ।	9. Please correctly fill your Roll Number in O.M.R. Sheet. **5 Marks** can be deducted for filling wrong or incomplete Roll Number.

चेतावनी : अगर कोई अभ्यर्थी नकल करते पकड़ा जाता है या उसके पास से कोई अनधिकृत सामग्री पाई जाती है, तो उस अभ्यर्थी के विरुद्ध पुलिस में प्राथमिकी दर्ज कराते हुए विविध नियमों-प्रावधानों के तहत कार्यवाही की जाएगी । साथ ही विभाग ऐसे अभ्यर्थी को भविष्य में होने वाली विभाग की समस्त परीक्षाओं से विवर्जित कर सकता है ।

Warning : If a candidate is found copying or if any unauthorized material is found in his/her possession, F.I.R. would be lodged against him/her in the Police Station and he/she would liable to be prosecuted. Department may also debar him/her permanently from all future examinations.

इस परीक्षा पुस्तिका को तब तक न खोलें जब तक कहा न जाए ।
Do not open this Test Booklet until you are asked to do so.

03-□

1. The concept of overall coefficient of heat transfer is used in heat transfer problems of
   (1) Conduction
   (2) Convection
   (3) Radiation
   (4) Conduction and convection

2. Which one of the following heat exchangers gives parallel straight line pattern of temperature distribution for both cold and hot fluid ?
   (1) Parallel-flow with unequal heat capacities
   (2) Counter-flow with equal heat capacities
   (3) Parallel-flow with equal heat capacities
   (4) Counter-flow with unequal heat capacities

3. In free convection heat transfer transition from laminar to turbulent flow is governed by the critical value of the
   (1) Reynold's number
   (2) Grashoff's number
   (3) Reynold's number, Grashoff's number
   (4) Prandtl number, Grashoff's number

4. A refrigerating machine having coefficient of performance equal to 2 is used to remove heat at the rate of 1200 kJ/min. What is the power required for this machine ?
   (1) 80 kW
   (2) 60 kW
   (3) 20 kW
   (4) 10 kW

5. Air at dry bulb temperature of 35 degree Celsius and dew point temperature of 25 degree Celsius passes through an air washer whose temperature is maintained at 20 degree Celsius. What is the nature of process involved ?
   (1) Cooling and humidification
   (2) Sensible cooling
   (3) Heating and dehumidification
   (4) Cooling and dehumidification

03

6. During the process of boiling and condensation, only a phase change takes place and one fluid remains at constant temperature throughout the heat exchanger. In terms of Number of Transfer Units (NTU), the effectiveness of such an exchanger would be

(1) $\dfrac{NTU}{1 + NTU}$

(2) $1 - \exp(-NTU)$

(3) $\dfrac{1 - \exp(-2\,NTU)}{2}$

(4) Cannot be worked out as the heat capacities are not known.

7. The thermal resistance for heat conduction through a hollow sphere of inner radius r_1 and outer radius r_2 is

(1) $\dfrac{4\,\pi K(r_2 - r_1)}{r_1 r_2}$

(2) $\dfrac{r_2 - r_1}{4\,\pi K r_1 r_2}$

(3) $\dfrac{(r_2 - r_1)\,(r_1\,r_2)}{4\,\pi K}$

(4) None of these

Where K is the thermal conductivity of the material of the sphere.

8. A gray body is one whose absorptivity

(1) varies with temperature

(2) varies with wavelength of incident ray

(3) varies with temperature and wavelength of incident ray

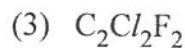(4) does not vary with temperature and wavelength of incident ray

9. For high C.O.P.

(1) Critical temperature in general should be low

(2) Critical temperature in general should be high

(3) Critical temperature is insignificant

(4) Critical pressure is important

10. Chemical formula of Freon-12 (R-12) is

(1) CCl_2F_2

(2) $CHCl_2F$

(3) $C_2Cl_2F_2$

(4) CH_3Cl

11. Parameter that remains constant during the process of adiabatic saturation is

(1) Wet bulb temperature

(2) Dry bulb temperature

(3) Specific humidity

(4) Dew point temperature

12. The wet bulb depression is zero, when relative humidity is equal to

(1) zero

(2) 50%

(3) 75%

(4) 100%

13. The heat flow equation through a sphere of inner radius r_1 and outer radius r_2 is to be written in the same form as that for heat flow through a plane wall. For wall thickness $(r_2 - r_1)$, the equivalent mean radius for the spherical shell is

(1) $\dfrac{r_1 + r_2}{2}$

(2) $r_1\, r_2$

(3) $\sqrt{r_1\, r_2}$

(4) $\dfrac{r_1 + r_2}{\log_e(r_2/r_1)}$

14. Fourier law of heat conduction gives the heat flow for

(1) irregular surfaces

(2) non-uniform temperature surfaces

(3) one dimensional cases only

(4) two dimensional cases only

15. The thickness of thermal and hydrodynamic boundary layer is equal if Prandtl number is

(1) equal to 1

(2) greater than 1

(3) less than 1

(4) equal to Nusselt number

16. For spheres, the critical thickness of insulation is given by

(1) $\dfrac{h}{2K}$

(2) $\dfrac{2K}{h}$

(3) $\dfrac{K}{h}$

(4) $\dfrac{K}{2\pi h}$

Where K = thermal conductivity, h = convective heat transfer coefficient

17. The capacity of a domestic refrigerator is in range of

    (1) 0.1 to 0.3 TR

    (2) 1 to 3 TR

    (3) 3 to 5 TR

    (4) 5 to 7 TR

18. In a psychrometric process, the sensible heat added is 30 kJ/sec and latent heat added is 20 kJ/sec. The sensible heat factor for the process is

    (1) 0.3

    (2) 0.6

    (3) 0.67

    (4) 1.5

19. Efficiency of Carnot engine is given as 80%. If the cycle direction is reversed, what will be the value of COP of reversed Carnot cycle ?

    (1) 1.25

    (2) 0.8

    (3) 0.5

    (4) 0.25

20. A simply supported beam carrying a uniformly distributed load over its whole span, is propped at the centre of the span so that the beam is held to the level of the end supports. The reaction of the prop will be

    (1) half the distributed load

    (2) 3/8th the distributed load

    (3) 5/8th the distributed load

    (4) 0 distributed load

21. During a tensile test on a specimen of 1 cm^2 cross-section, maximum load observed was 8 tonnes and area of cross-section at neck was 0.5 cm^2. Ultimate tensile strength of specimen is

    (1) 4 tonnes/cm^2

    (2) 8 tonnes/cm^2

    (3) 16 tonnes/cm^2

    (4) 22 tonnes/cm^2

22. The elongation of a freely hanging uniform steel rope, if its length is doubled will increase in the ratio of

(1) 2 : 1

(2) 1 : 1

(3) 4 : 1

(4) 8 : 1

23. For a simply supported beam, when shear force at a point is zero, then bending moment at that point will be

(1) Zero

(2) Minimum

(3) Maximum

(4) Infinity

24. Compare the strengths of solid and hollow shafts both having outside diameter D and hollow shaft having inside diameter of D/2 in torsion. The ratio of strength of solid to hollow shafts in torsion will be

(1) 0.5

(2) 0.75

(3) 15/16

(4) 1/16

25. When a rectangular beam is loaded transversely, the maximum tensile stress is developed on the

(1) top layer

(2) bottom layer

(3) neutral axis

(4) every cross-section

26. A rod is enclosed centrally in a tube and the assembly is tightened by rigid washers. If the assembly is subjected to compressive load, then

(1) rod is under compression

(2) tube is under compression

(3) both rod and tube are under compression

(4) tube is under tension, rod under compression

27. When there is a sudden increase or decrease in shear force diagram between any two points, it indicates that there is a

(1) point load at two points

(2) no loading between two points

(3) uniformly distributed load between two points

(4) uniformly varying load between two points

28. A body is subjected to direct tensile stress of 300 MPa in one plane accompanied by a simple shear stress of 200 MPa. The maximum normal stress will be

(1) −100 MPa

(2) 250 MPa

(3) 300 MPa

(4) 400 MPa

29. The bulk modulus of a body is equal to

(1) $\dfrac{ME}{3(M-2)}$

(2) $\dfrac{ME}{3(M+2)}$

(3) $\dfrac{ME}{2(M-2)}$

(4) $\dfrac{ME}{2(M+2)}$

(where $\dfrac{1}{M}$ = Poisson's Ratio and E = Young's Modulus of Elasticity)

30. The strain energy stored in a body of volume V subjected to uniform stress σ is

(1) $\sigma \times e/V$

(2) $\sigma E^2/V$

(3) $\sigma \times V^2/E$

(4) $(\sigma^2/2E) \times V$

31. Bending moment M and torque T is applied on a solid circular shaft. If the maximum bending stress equals to maximum shear stress developed, then M is equal to

(1) T/2

(2) T

(3) 2T

(4) 4T

32. A beam of uniform strength is one which has same

(1) Bending stress at every section

(2) Deflection throughout the beam

(3) Bending moment throughout the beam

(4) Shear force throughout the beam

33. In a triangular section, the maximum shear stress occurs at

   (1) Apex of the triangle

   (2) Mid of the height

   (3) 1/3 of the height

   (4) base of the triangle

34. If the principal stresses corresponding to a two-dimensional state of stress are σ_1 and σ_2. When σ_1 is greater than σ_2 and both are tensile, then which of the following would be correct criterion for failure by yielding, according to maximum shear stress theory ?

   (1) $\dfrac{\sigma_1 - \sigma_2}{2} = \pm \dfrac{\sigma_{yp}}{2}$

   (2) $\dfrac{\sigma_1}{2} = \pm \dfrac{\sigma_{yp}}{2}$

   (3) $\dfrac{\sigma_2}{2} = \pm \dfrac{\sigma_{yp}}{2}$

   (4) $\sigma_1 = \pm 2\sigma_{yp}$

35. In designing a sleeve and cotter joint, the outside diameter of the sleeve is taken as

   (1) 1.5 d

   (2) 2.5 d

   (3) 3 d

   (4) 4 d

36. Two shafts A and B are made of same material. The diameter of shaft A is twice that of B. The torque transmitted by shaft A will be

   (1) Twice

   (2) Four

   (3) Eight

   (4) Sixteen

37. An universal coupling is used to connect two mild steel shafts transmitting a torque of 5000 N-m. Assuming that the shafts are subjected to torsion only, find the diameter of the shafts and pins. The allowable shear stresses for the shaft and pin may be taken as 60 MPa and 28 MPa respectively.

   (1) 75 mm, 40 mm

   (2) 95 mm, 50 mm

   (3) 40 mm, 85 mm

   (4) 75 mm, 60 mm

38. The metal suitable for bearings subjected to heavy loads is

(1) Silicon bronze

(2) White metal

(3) Monel metal

(4) Phosphor bronze

39. In a thick cylindrical shell, the maximum radial stress at the outer surfaces of the shell is

(1) zero

(2) P

(3) –P

(4) 2P

40. When a nut is tightened by placing a washer below it, the bolt will be subjected to

(1) Tensile stress

(2) Compressive stress

(3) Shear stress

(4) None of these

41. The design of shafts made of brittle materials is based on

(1) Guest's theory

(2) Rankine's theory

(3) St. Venant's theory

(4) Von Mises theory

42. The piston pin bearing in heavy duty diesel engines are

(1) Needle roller bearings

(2) Tapered roller bearings

(3) Spherical roller bearings

(4) Cylindrical roller bearings

43. The transverse fillet welded joints are designed for

(1) Tensile strength

(2) Compressive strength

(3) Bending strength

(4) Shear strength

44. A saddle key

   (1) is provided in the hub only and hollowed to fit the shaft

   (2) has flat surface and the shaft is planned off to accommodate the key

   (3) is fitted such that each withstand torsion is in one direction only

   (4) None of these

45. Taper usually provided on cotter is

   (1) 1 in 5

   (2) 1 in 10

   (3) 1 in 24

   (4) 1 in 40

46. Which process will increase the fatigue duration of parts ?

   (1) Finishing and polishing

   (2) Shot peening

   (3) Decarburisation

   (4) Electroplating

47. The endurance limit of a material with finished surface in comparison to rough surface is

   (1) more

   (2) less

   (3) same

   (4) unpredictable

48. What is the safe static tensile load for a M36 × 4C bolt of mild steel having yield stress of 280 MPa and factor of safety 1.5 ?

   (1) 285 kN

   (2) 190 kN

   (3) 142.5 kN

   (4) 95 kN

49. Stress concentration factor is defined as the ratio of

   (1) Maximum stress to the endurance limit

   (2) Nominal stress to the endurance limit

   (3) Maximum stress to the nominal stress

   (4) Nominal stress to the maximum stress

50. For a speed ratio of 100, smallest gear box is obtained by using

(1) A pair of spur gears

(2) A pair of helical and a pair of spur gear compounded

(3) A pair of bevel and a pair of spur gear compounded

(4) A pair of helical and a pair of worm gear compounded

51. In an automobile, if the vehicle makes a left turn, the gyroscopic torque

(1) increases the forces on the outer wheels

(2) decreases the forces on the outer wheels

(3) does not affect the forces on the outer wheels

(4) None of these

52. When the nature of contact between the elements of a pair is such that it can only slide relative to the other, the pair is known as

(1) Screw pair

(2) Spherical pair

(3) Turning pair

(4) Sliding pair

53. The mass 'M' attached to shaft rotating at W rad/sec at radius 'r' from axis of shaft is balanced by mass B at radius 'b' from axis of shaft, in the same plane of rotation. The necessary condition for balancing is

(1) $MWr = BWb$

(2) $\dfrac{MW^3}{r} = \dfrac{BW^2}{b}$

(3) $Mr = Bb$

(4) $\dfrac{M}{B} = \dfrac{r}{b}$

54. Path described by the trace point as referred to cams is known as

(1) Base circle

(2) Prime circle

(3) Pitch circle

(4) Pitch curve

55. For block brakes θ = angle of lap, μ = co-efficient of friction; if $\theta > 45°$, the equivalent coefficient of friction is

(1) $\mu' = \mu\left(\dfrac{4\sin\theta}{\sin\theta + \theta}\right)$

(2) $\mu' = \mu\left[\dfrac{4\sin\theta/2}{\sin\theta/2 + \theta/2}\right]$

(3) $\mu' = \mu\left[\dfrac{4\sin\theta/2}{\sin\theta + \theta}\right]$

(4) $\mu' = \mu\left(\dfrac{\sin\theta}{\sin\theta + \theta}\right)$

56. The circular pitch of spur gears is defined as the ratio of

(1) The circumference of the pitch circle to the number of teeth.

(2) The circumference of the pitch circle to the diameter of the pitch circle.

(3) The diameter of pitch circle to the number of teeth.

(4) The number of the teeth to the diameter of pitch circle.

57. For forced damped vibration system, the vibration isolation is possible only when

(1) $\dfrac{W}{W_n} = 1$

(2) $\dfrac{W}{W_n} < 1$

(3) $\dfrac{W}{W_n} < \sqrt{2}$

(4) $\dfrac{W}{W_n} > \sqrt{2}$

58. In case of cycloidal tooth profile gears in mesh

(1) The pressure angle is always constant throughout the contact of mating teeth.

(2) The path of contact is a straight line.

(3) The variation in centre distance affects the angular velocity ratio.

(4) There is interference in these gears.

59. A rotating mass having moment of inertia of 30 kg m^2 rotates at 800 rpm and travelling in a curve of 170 m radius at a speed of 240 km/hr. It will experience a gyroscopic reaction of

(1) 10 m k$_{gf}$

(2) 100 m k$_{gf}$

(3) 1000 m k$_{gf}$

(4) None of these

60. In a rim type of flywheel, the major mass is

(1) concentrated around periphery

(2) concentrated at the centre

(3) contributed due to arms

(4) balanced by centripetal forces

61. A simple spring mass vibrating system has a natural frequency of N. If the spring stiffness is halved and mass is doubled, then natural frequency will become

(1) N/2

(2) 2 N

(3) 4 N

(4) 8 N

62. A shaft has two heavy rotors mounted on it. The transverse natural frequencies considering each of the rotor separately are 100 Hz and 200 Hz respectively. The lowest critical speed is

(1) 5367 rpm

(2) 6000 rpm

(3) 9360 rpm

(4) 12000 rpm

63. For correct steering of a four wheeled vehicle the condition to be satisfied is

(1) $\cot \phi - \cot \theta = \dfrac{W}{H}$

(2) $\tan \phi - \tan \theta = \dfrac{W}{H}$

(3) $\cos \phi - \cos \theta = \dfrac{W}{H}$

(4) $\dfrac{\cot \phi - \cot \theta}{\theta} = \dfrac{W}{H}$

(where W = Distance between points of front wheels, H = Wheel base)

64. Considering the safe design, the friction clutch should be designed

(1) Assuming uniform pressure

(2) Assuming uniform wear

(3) Assuming any criteria, either uniform pressure or uniform wear

(4) Assuming uniform pressure for high torque and uniform wear for low torque

65. A pontoon of 15696 kN displacement is floating in water. A weight of 245.25 kN is moved through a distance of 8 m across the deck of pontoon, which tilts the pontoon through an angle 4°. The meta-centric height of the pontoon will be

(1) 1.788 m

(2) 2.788 m

(3) 3.788 m

(4) 4.788 m

66. Find the velocity of the flow of an oil through a pipe, when the difference of mercury level in a differential U-tube manometer connected to the two tappings of pitot-tube is 100 mm. Take co-efficient of pitot tube 0.98 and specific gravity of oil = 0.8.

(1) 5.49 m/sec

(2) 5.94 m/sec

(3) 4.49 m/sec

(4) 4.94 m/sec

67. A turbine is to operate under a head of 25 m at 200 rpm. The discharge is 9 m³/s. If the overall efficiency is 90% then the power generated by the turbine will be

(1) 1968.5 kW

(2) 1986.5 kW

(3) 1998.5 kW

(4) 1960 kW

68. Delivery head of a centrifugal pump is

(1) Directly proportional to N

(2) Inversely proportional to N

(3) Directly proportional to N^2

(4) Inversely proportional to N^2

69. Which mouthpiece is having maximum co-efficient of discharge ?

(1) External mouthpiece

(2) Convergent-divergent mouthpiece

(3) Internal mouthpiece

(4) None of these

70. The pitot static tube measures

(1) Dynamic pressure

(2) Static pressure

(3) Total pressure

(4) Difference in static & dynamic pressure

71. Main characteristic curves of a turbine means

    (1) Curves at constant speed

    (2) Curves at constant efficiency

    (3) Curves at constant head

    (4) None of these

72. Mechanical efficiency of a turbine is the ratio of

    (1) Power at the inlet to the power at the shaft of turbine

    (2) Power at the shaft to the power given to the runner

    (3) Power at the shaft to the power at the inlet of turbine

    (4) None of these

73. The coefficient of friction for laminar flow through a circular pipe is given by

    (1) $f = \dfrac{0.0791}{(R_e)^{1/4}}$

    (2) $f = \dfrac{16}{R_e}$

    (3) $f = \dfrac{64}{R_e}$

    (4) None of these

74. A pipe having a length 200 m and 200 mm diameter with friction factor 0.015, is to be replaced by a 400 mm diameter pipe of friction factor 0.012 to convey the same quantity of flow. The equivalent length of the new pipe for the same head loss will be

    (1) 8300 m

    (2) 8240 m

    (3) 8110 m

    (4) 8000 m

75. In general, the vanes of a centrifugal pump are

    (1) Curved forward

    (2) Radial

    (3) Curved backward

    (4) Spiral

76. Pascal-Second (Pa.S) is the unit of

    (1) Pressure

    (2) Kinematic Viscosity

    (3) Dynamic Viscosity

    (4) Surface tension

77. The discharge through a single acting reciprocating pump is

 (1) Q = ALN

 (2) Q = ALN/60

 (3) Q = 2 ALN/60

 (4) Q = 2ALN

78. Gauge pressure at a point is equal to

 (1) Absolute pressure plus atmospheric pressure

 (2) Absolute pressure minus atmospheric pressure

 (3) Vacuum pressure plus absolute pressure

 (4) None of these

79. The loss of head due to sudden contraction of a pipe is equal to

 (1) $\left(\dfrac{1}{C_c}-1\right)^2 \dfrac{V_2^2}{2g}$

 (2) $\left(1-\dfrac{1}{C_c}\right)^2 \dfrac{V_2^2}{2g}$

 (3) $\dfrac{1}{C_c}\left(1-\dfrac{V_2^2}{2g}\right)$

 (4) None of these

80. The speed ratio for Pelton wheel varies from

 (1) 0.45 to 0.50

 (2) 0.6 to 0.7

 (3) 0.3 to 0.4

 (4) 0.8 to 0.9

81. The fluid forces considered in Navier Strokes equation are

 (1) gravity, pressure, viscous

 (2) gravity, pressure, turbulence

 (3) pressure, viscous, turbulence

 (4) None of these

82. A piece weighing 3 kg in air was found to weight 2.5 kg when submerged in water. Its specify gravity is

 (1) 1

 (2) 5

 (3) 7

 (4) 6

83. Chip ratio is defined as ratio of

 (1) Chip thickness to uncut thickness

 (2) Uncut thickness to chip thickness

 (3) Length of uncut material to length of chip

 (4) None of these

84. A cutting tool has a nose radius of 1.8 mm. The feed rate for a theoretical surface roughness of $R_t = 5$ micron is

(1) 0.360 mm/rev

(2) 0.268 mm/rev

(3) 0.036 mm/rev

(4) 0.0187 mm/rev

85. Which of the following methods uses combination of electrical and chemical energy for machining ?

(1) Ultrasonic machining

(2) Abrasive jet machining

(3) Electrochemical machining

(4) Electron beam machining

86. In the Bath-Tub curve representing failure rate with respect to time, the useful life is represented by

(1) Debugging phase

(2) Wear out phase

(3) Chance failure phase

(4) All of these

87. Which of the following is for Environment management ?

(1) ISO-9000

(2) ISO-14000

(3) ISO-26000

(4) ISO-31000

88. Reorder point in inventory indicates the

(1) Quantity to be ordered

(2) Cost of the item

(3) Stock level of inventory when the other is to be placed

(4) None of these

89. Occupational health not concerned merely with the occupational syndromes, rather it also includes

(1) All the factor affecting health of workers

(2) The factors affecting only physical health of workers

(3) The factors affecting only mental health of workers.

(4) None of these

90. Hazardous Substance Rules started at year _____ and Factories Act in _____ .

(1) 1986, 1948

(2) 1948, 1986

(3) 1884, 1948

(4) 1986, 1968

91. The Indian Boilers Act _____ was enacted with the objective to provide mainly for the safety of life and property of persons from the danger of explosions of steam boilers and for achieving uniformity in registration and inspection during operation and maintenance of boilers in India.

(1) 1903

(2) 1914

(3) 1918

(4) 1923

92. In which type of welding molten metal is poured for joining the metals ?

(1) Gas welding

(2) MIG welding

(3) Thermit welding

(4) Arc welding

93. Diamond pin location is used in a fixture because

(1) It does not wear out.

(2) It takes care of any variation in centre distance between two holes.

(3) It is easy to clamp the part on diamond pins.

(4) It is easy to manufacture.

94. A casting of size 100 mm × 100 mm × 50 mm is required. Assume volume shrinkage of casting is 2.6%. If the height of the riser is 80 mm and riser volume desired is 4 times the shrinkage in casting, what is the appropriate riser diameter in mm ?

(1) 14.38

(2) 20.34

(3) 28.76

(4) 57.52

95. Collapsible tooth paste tubes are manufactured by

(1) Direct extrusion

(2) Piercing

(3) Impact extrusion

(4) Indirect extrusion

96. The '5S' are about

    (1) JIT

    (2) Cost reduction

    (3) Smoothening the flow of the operations

    (4) Good housekeeping

97. As per Factories Act, "Child" means a person who has not completed his _____ year of age. [Sec 2(c)]

    (1) Fourteenth

    (2) Fifteenth

    (3) Sixteenth

    (4) Eighteenth

98. For a M/M/1 : ∞/FCFS queue, the mean arrival rate is equal to 10 per hour and the mean service rate is 15 per hour. The expected queue length is

    (1) 1.33

    (2) 1.53

    (3) 2.75

    (4) 3.20

99. A process is to be controlled with standard values $\mu = 15$ and $\sigma = 3.6$. The sample size is 9. The control limits for the $\overline{X}$ chart are

    (1) 15 ± 10.8

    (2) 15 ± 3.6

    (3) 0.4 ± 10.8

    (4) 0.4 ± 3.6

100. During ultrasonic machining, the metal removal is achieved by

    (1) High frequency eddy currents

    (2) High frequency sound waves

    (3) Hammering action of abrasive particles

    (4) Rubbing action between tool and workpiece

101. The approximate value of the tool life exponent 'n' of ceramic tool is

    (1) 0.03 to 0.08

    (2) 0.08 to 0.20

    (3) 0.20 to 0.40

    (4) 0.40 to 0.60

102. The quantum of heat generated in resistance welding depends upon

   (1) welding current alone

   (2) resistance of current conducting path alone

   (3) area of welding electrode alone

   (4) None of these

103. The main objective of ISO-9000 family of quality management is

   (1) Employee satisfaction

   (2) Skill enhancement

   (3) Customer satisfaction

   (4) Environmental issues

104. The earliest occurrence time for event '1' is 8 weeks and latest occurrence time for event '1' is 26 weeks. The earliest occurrence time for event '2' is 32 weeks and latest occurrence time for event '2' is 37 weeks. If the activity time is 11 weeks, then total float will be

   (1) 11

   (2) 13

   (3) 18

   (4) 24

105. In blanking operation, the clearance is provided on

   (1) die

   (2) punch

   (3) half on die and half on punch

   (4) may be provided on any member

106. Circular saw blades are specified by their diameter, number of teeth and

   (1) gauge

   (2) maximum rpm

   (3) arbor-hole

   (4) number of gullets

107. Which of the following is not a casting defect ?

   (1) hot tear

   (2) blow hole

   (3) scab

   (4) decarburisation

108. A system contains 2 components. Reliability of the components is measured for 800 hours and time to failure components are found to be exponential. If each component has reliability of 0.8, then the system reliability at the end of 800 hours will be _____ .

[system are connected in parallel structure]

(1) 0.22

(2) 0.16

(3) 0.96

(4) 0.32

109. Max $z = 3x_1 + 5x_2$

S.t. $x_1 \leq 4; 2x_2 \leq 12$

$3x_1 + 2x_2 \leq 18$

$x_1, x_2 \geq 0$

What is the optimum value of z ?

(1) $x_1 = 2, x_2 = 6, z = 36$

(2) $x_1 = 3, x_2 = 4, x_3 = 29$

(3) $x_1 = 4, x_2 = 3, x_3 = 27$

(4) $x_1 = 5, x_2 = 2, x_3 = 25$

110. Which one of the following sequences indicates the correct order for flue gas flow in the steam power plant layout ?

(1) Superheater, Economiser, Air preheater

(2) Economiser, Air preheater, Superheater,

(3) Air preheater, Economiser, Superheater

(4) Economiser, Superheater, Air preheater

111. Out of the following impurities generally found in water, which one requires special consideration in case of very high pressure boiler ?

(1) Hydrogen

(2) Ammonia

(3) Silica

(4) Dissolved salt .

112. Locomative boiler is a

(1) Single tube, horizontal, internally fired and stationary boiler

(2) Single tube, vertical, externally fired and stationary boiler

(3) Multi-tubular, horizontal, internally fired and mobile boiler

(4) Multi-tubular, horizontal, externally fired and stationary boiler

113. A turbine generator unit has output of 150 mW and efficiency of 0.80. Calculate energy supplied per hour by steam generator.

(1) 675×10^9 J

(2) 576×10^9 J

(3) 605×10^9 J

(4) 705×10^9 J

114. The component of torque converter that allows torque multiplication is

(1) Turbine

(2) Impeller

(3) Stator

(4) Freewheel

115. Which of the following is not a boiler mounting ?

(1) Fusible plug

(2) Blowdown valve

(3) Water level indicator

(4) Preheater

116. The excess air required for combustion of pulverised coal is of the order of

(1) 100 to 150%

(2) 30 to 60%

(3) 15 to 40%

(4) 5 to 10%

117. A device which is used to drain off water from steam pipes without escape of steam is called

(1) Steam separator

(2) Steam trap

(3) Pressure reducing valve

(4) Injector

118. Ratean turbine is basically a

(1) Pressure compounded turbine

(2) Velocity compounded turbine

(3) Pressure velocity compounded turbine

(4) None of these

119. In forced circulation boilers, about 90% of water is recirculated without evaporation. The circulation ratio is

(1) 0.1

(2) 0.9

(3) 9

(4) 10

120. An impulse turbine produces 50 kW of power when the blade mean speed is 400 m/s. What is the rate of change of momentum tangential to the rotor ?

(1) 200 N

(2) 175 N

(3) 150 N

(4) 125 N

121. A moderator used in a thermal reactor of nuclear plant

    (1) Accelerates the fission reaction

    (2) Slow down the speed of fast neutrons

    (3) Increases the energy emitted in a fission

    (4) Absorbs neutrons

122. If the enthalpy drop across the fixed blades in a turbine is zero, the degree of reaction is

    (1) Zero

    (2) 0.5

    (3) Unity

    (4) Infinity

123. In most steam power plants, closed feedwater heaters are favoured, but one open heater is used

    (1) To reduce cost.

    (2) To achieve better heat transfer.

    (3) To provide high feed water temperature.

    (4) To deareate the feed water by removing the dissolved gas.

124. These tubes in a natural circulation water tube boiler are smaller in number and bigger in diameter

    (1) Downcomers

    (2) Risers

    (3) Both downcomers and risers

    (4) Superheaters

125. In De Laval nozzle expanding superheater steam from 10 bar to 0.1 bar, the pressure at minimum cross-section will be

    (1) 3.3 bar

    (2) 5.46 bar

    (3) 8.2 bar

    (4) 9.9 bar

126. Presence of moisture in fuel oil would

    (1) keep the burner tips cool

    (2) aid in proper combustion

    (3) cause sputtering, possibly extinguishing flame

    (4) clean the nozzles

127. The net result of pressure-velocity compounding of steam turbine is

(1) less number of stages

(2) large turbine for a given pressure drop

(3) shorter turbine for a given pressure drop

(4) lower friction loss

128. The softest and hardest phases in plain carbon steel are

(1) ferrite and cementite respectively

(2) austenite and martensite respectively

(3) pearlite and cementite respectively

(4) ferrite and bainite respectively

129. Which alloying element does not improve the machinability of steel ?

(1) Sulphur

(2) Silicon

(3) Phosphorous

(4) Lead

130. Which alloying element improves the corrosion resistance of the steel ?

(1) Silicon

(2) Zinc

(3) Chromium

(4) Copper

131. Hardening of steel does not increase its

(1) residual internal stresses

(2) corrosion resistance

(3) tensile strength

(4) hardness

132. Which of the following is not strengthening mechanism for multiphase structural steel ?

(1) precipitation strengthening

(2) dispersion strengthening

(3) solid-solution strengthening

(4) None of these

133. Which of the following is not improved by grain size reduction ?

(1) Hardness

(2) Toughness

(3) Elasticity

(4) Strength

03

134. _____ in steel is mainly responsible for the occurrence of hair line crack.

(1) Sulphur

(2) Hydrogen

(3) Nitrogen

(4) Manganese

135. As per Gibb's phase rule, if number of components is equal to 2, then the number of phases will be

(1) ≤ 2

(2) ≤ 3

(3) ≤ 4

(4) ≤ 5

136. Some high speed steels have cobalt (Co) added to them in amounts ranging from 2% to 15%, since this element improves the

(1) cutting efficiency, especially at high temperature

(2) depth hardening ability of the HSS tool

(3) red hardness of the HSS tool

(4) grain structure of the HSS tool

137. Austempering is employed to obtain

(1) 100% martensite structure

(2) 100% bainitic structure

(3) 50% martensite and 50% bainitic structure

(4) 100% pearlite structure

138. Which one of the following is the process to refine the grains of metal after it has been distorted by hammering or cold working ?

(1) Annealing

(2) Softening

(3) Recrystallizing

(4) Normalizing

139. The fine grain size in austenite steel increase

(1) toughness

(2) creep strength

(3) hardenability

(4) rough machinability

140. Annealing process is not applicable for improve

   (1) machinability

   (2) internal stress

   (3) refine grain

   (4) hardness

141. Addition of Tungsten in steel

   (1) improve strength at elevated temperature

   (2) improve corrosion resistance

   (3) decrease hardness

   (4) improve coarse grain

142. The super-saturated solution of carbon in α-iron is known as

   (1) ferrite

   (2) austenite

   (3) martensite

   (4) cementite

143. Toughness of a material is measured by the

   (1) Vicker's hardness test

   (2) Scratch test

   (3) Universal testing machine

   (4) Notched bar test

144. Fluorescent dye method of testing is used for detecting the _____ of an object.

   (1) surface crack

   (2) interior defects

   (3) structural characteristics

   (4) None of these

145. Corrosion of metals involves

   (1) Physical reactions

   (2) Chemical reactions

   (3) Both

   (4) None

146. What is the unit of wear coefficient (k) ?

   (1) mm^3/sec

   (2) $mm^3/N\text{-}m$

   (3) mm^3/N

   (4) dimensionless

147. Weld decay mostly found in

   (1) Stainless steel

   (2) Mild steel

   (3) Cast iron

   (4) Wrought iron

148. The size of hardness steel ball for Brinell tester

(1) 5 mm

(2) 25 mm

(3) 10 mm

(4) 1 mm

149. Creep resistance decreases due to

(1) low stacking fault energy

(2) fine dispersed size

(3) high melting point

(4) small grain size

150. Principle of dye penetrant test is based on

(1) magnetic domain

(2) absorption of X-ray

(3) capillary action

(4) polarized sound waves in liquid

151. In which NDT test piezoelectric transducer converts the electric energy to acoustic energy

(1) Radiography

(2) Magnetic particle test

(3) Ultrasonic

(4) Eddy current

152. Which of the following types of rays is used in radiography for the inspection of welded joints ?

(1) X-rays

(2) Infrared rays

(3) Ultraviolet rays

(4) Visible rays

153. Resilience of material becomes important when it is subjected to

(1) fatigue

(2) thermal stresses

(3) shock loading

(4) pure static loading

154. Fatigue strength does not increased by

(1) fine grain size

(2) shot peening

(3) grinding and lapping surface

(4) decarburization

155. Second Law of thermodynamics defines

(1) Heat

(2) Work

(3) Entropy

(4) Internal Energy

156. The efficiency of Carnot Cycle may be increased by

(1) Increasing the highest temperature

(2) Decreasing the highest temperature

(3) Increasing the lowest temperature

(4) Decreasing the lowest temperature

157. The term N.T.P. stands for _____

(1) Nominal Temperature and Pressure

(2) Natural Temperature and Pressure

(3) Normal Temperature and Pressure

(4) Normal Thermodynamic Pressure

158. 0.5 kg of air (ideal gas) executes a Carnot power cycle having a thermal efficiency of 50 percent. The heat transfer to the air during the isothermal expansion is 40 kJ. At the beginning of the isothermal expansion the pressure is 7 bar and the volume is 0.12 m³. Determine the maximum and minimum temperature for the cycle in K.

(1) 292.7 K and 585.4 K

(2) 585.4 K and 292.7 K

(3) 192.3 K and 787.4 K

(4) 787.4 K and 192.3 K

159. Which property is an intensive property of the system ?

(1) Specific enthalpy

(2) Volume

(3) Kinetic energy

(4) Entropy

160. For an irreversible thermodynamic cycle

(1) $\int \dfrac{d\theta}{T} > 0$

(2) $\int \dfrac{d\theta}{T} < 0$

(3) $\int \dfrac{d\theta}{T} \geq 0$

(4) $\int \dfrac{d\theta}{T} \leq 0$

161. Cetane number of a fuel is a measure of its

(1) Viscosity

(2) Volatility

(3) Ignition quality

(4) API specific gravity

162. In a polytropic process, if $n = \infty$, then the process becomes

(1) Constant volume process

(2) Constant pressure process

(3) Isothermal process

(4) None of these

163. For a steady process, the conditions at stage 1 and stage 2 are, respectively, $h_1 = 300$ kJ/kg, $h_2 = 150$ kJ/kg, $S_1 = 1.25$ kJ/kg · K and $S_2 = 0.8$ kJ/kg · K. The availability at the ambient temperature 300 K will be

(1) 15 kJ

(2) 20 kJ

(3) 25 kJ

(4) 35 kJ

164. A house requires 60 M cal/hr in winter for heating. Heat pump absorbs heat from cold air outside and requires 8 M cal/hr of work. The COP will be

(1) 0.75

(2) 6.5

(3) 7.5

(4) 10

165. An inventor claims that his heat engine has following specifications :

Fuel burned per hour – 3 kg

Power developed – 50 kW

Heating value of fuel – 75000 kJ/kg

Temp limits – 627 to 27 °C

So, is this case a

(1) reality

(2) impossible

(3) imaginary

(4) costly

166. At what value of cut-off ratio, the efficiency of diesel engine approaches to Otto cycle efficiency ?

(1) zero

(2) $\dfrac{1}{5}$

(3) $\dfrac{4}{5}$

(4) 1

167. If petrol is used in a diesel engine, then

(1) Low power will be produced

(2) Efficiency will be low

(3) Higher knocking will occur

(4) Black smoke will be produced

168. If the speed of the engine is increased, the indicated power will

(1) Increase

(2) Decrease

(3) Remain same

(4) All of these

169. In diesel engine the duration between the start of injection and ignition is known as

(1) Physical delay

(2) Chemical delay

(3) Ignition delay

(4) Period of ignition

170. The ratio of the indicated thermal efficiency to the air standard efficiency is known as

(1) Mechanical efficiency

(2) Overall efficiency

(3) Volumetric efficiency

(4) Relative efficiency

171. For a four cylinder vertical engine, the commonly used firing order is

(1) $1 - 2 - 3 - 4$

(2) $3 - 1 - 2 - 4$

(3) $4 - 2 - 3 - 1$

(4) $1 - 3 - 4 - 2$

172. With increase in compression ratio, flame speed

(1) Increases

(2) Decreases

(3) Remains the same

(4) None

173. Common rail injection system uses injection pressures of the order

(1) $100 - 200$ bar

(2) $200 - 400$ bar

(3) $400 - 600$ bar

(4) 1500 bar

174. The main purpose of a thermostat in an engine cooling system is to

(1) Allow engine to warm-up quickly

(2) Prevent the coolant from boiling

(3) Pressurize the system

(4) Indicate to the driver the coolant temperature

175. Detergents are oil additives used to

(1) Reduce viscosity

(2) Increase fire point

(3) Prevent sludge formation

(4) Prevent foaming

176. The bore and stroke of a single cylinder four-stroke engine are 100 mm and 160 mm respectively. If the brake torque is 50 NM the bmep is

(1) 15 bar

(2) 10 bar

(3) 5 bar

(4) 7.6 bar

177. During idling condition a petrol engine requires which kind of air-fuel mixture ?

(1) leaw

(2) rich

(3) chemically correct

(4) None of these

178. In a Morse test, for a 2 cylinder, 2 stroke spark ignition engine, the brake power was 9 kW whereas the brake power of individual cylinders with spark cut off were 4.25 kW and 3.75 kW respectively. The mechanical efficiency of the engine is

(1) 90%

(2) 80%

(3) 45.5%

(4) 52.5%

179. The octane number of petrol generally available is

(1) 20 to 40

(2) 40 to 60

(3) 60 to 80

(4) 80 to 100

180. Heat is mainly transferred by conduction, convection and radiation in

(1) Insulated pipes carrying hot water

(2) Refrigerator freezer coil

(3) Boiler furnaces

(4) Condensation of steam in a condenser