A.C.F. & F.R.O. - 2018

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

1. सभी प्रश्नों के उत्तर दीजिए ।

2. सभी प्रश्नों के अंक समान हैं ।

3. प्रत्येक प्रश्न का केवल एक ही उत्तर दीजिए ।

4. एक से अधिक उत्तर देने की दशा में प्रश्न के उत्तर को गलत माना जाएगा ।

5. प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं, जिन्हें क्रमशः 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 ।

6. OMR उत्तर पत्रक इस परीक्षा पुस्तिका के अंदर रखा है । जब आपको परीक्षा पुस्तिका खोलने को कहा जाए, तो उत्तर-पत्रक निकाल कर ध्यान से केवल नीले बॉल पॉइंट पेन से विवरण भरें ।

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 ।

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 ।

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 ।

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 ।

INSTRUCTIONS FOR CANDIDATES

1. Answer **all** questions.

2. **All** questions carry equal marks.

3. Only **one** answer is to be given for each question.

4. If more than one answers are marked, it would be treated as wrong answer.

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. 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. **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. 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. Please correctly fill your Roll Number in O.M.R. Sheet. **5 Marks** can be deducted for filling wrong or incomplete Roll Number.

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.

22-▢

1. Cupronickle is an alloy of
   (1) 30 per cent Nickel and 70 per cent Copper, and is extensively used in condenser tubes
   (2) 10 per cent Chromium, 20 per cent Nickel and the rest Copper, and is recommended for boiler tubes
   (3) 30 per cent Copper and the rest Nickel, and is recommended for gas turbine blades
   (4) 70 per cent Nickel and 30 per cent Copper, and is extensively used in condenser tubes

2. The coordination number for FCC crystal structure is
   (1) 4   (2) 8
   (3) 12   (4) 16

3. Copper has an atomic radius of 0.128 nm (1.28A°), a FCC crystal structure and an atomic weight of 63.5 g/mol. Its theoretical density in g/cm^3 is
   (1) 8.94   (2) 8.89
   (3) 8.50   (4) 8.40

4. Annealing twins are typically found in metals that have the _____ crystal structure.
   (1) BCC   (2) HCP
   (3) FCC   (4) Unpredictable

5. Strengthening of single phase metals can be achieved by
   (1) Grain size reduction
   (2) Solid-solution alloying
   (3) Strain hardening
   (4) All of these

6. The effects of strain hardening may be removed by _____ heat treatment.
   (1) Tempering
   (2) Annealing
   (3) Normalizing
   (4) Spheroidising

7. The electric process of steel making is especially adopted to
   (1) Alloy and carbon tool steel
   (2) Magnet steel
   (3) High speed tool steel
   (4) All of these

8. The process in which carbon and nitrogen both are absorbed by the metal surface to get it hardened is known as
   (1) Carburising
   (2) Cyaniding
   (3) Flame hardening
   (4) Induction hardening

9. The lower critical temperature
   (1) decreases as the carbon content in steel increases
   (2) increases as the carbon content in steel increases
   (3) is same for all steels
   (4) depends upon the rate of heating

10. Addition of magnesium to cast iron increase its
    (1) Hardness
    (2) Ductility and strength in tension
    (3) Corrosion resistance
    (4) Creep strength

11. Shown below are four elements a, b, c and d with different states of plane stress. Using maximum shear stress theory for yield, which of the following will yield first ? Assume the material is homogenous and isotropic.
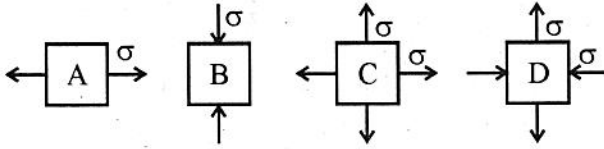
(1) A   (2) B

(3) C   (4) D

12. The equation for the deflected shape of a beam carrying a uniformly distributed load and simply supported at the ends is given by

$$y = \frac{1}{EI}\left(2x^3 - \frac{x^4}{6} - 36x\right)$$

where E is the elastic modulus of beam material and I is the second moment of beam cross-section area about neutral axis. What is the intensity of uniformly distributed load over the beam span ?

(1) 12 kN/m   (2) 8 kN/m

(3) 6 kN/m   (4) 4 kN/m

13. The state of stress at a point P in a two dimensional loading is such that the Mohr's circle is a point located at 145 MPa on the positive normal stress axis. The maximum and minimum principal stresses respectively from the Mohr's circle are

(1) 0, 0

(2) 0, –145 MPa

(3) + 145 MPa, + 145 MPa

(4) + 145 MPa, – 145 MPa

14. A machine component is subjected to fluctuating stress that varies from 40 MPa to 100 MPa. The corrected endurance limit stress for the machine component is 270 MPa. The ultimate tensile strength and yield strength of material are 600 MPa and 450 MPa respectively. The factor of safety against fatigue failure as per Soderberg's criterion is

(1) 3.75   (2) 4.39

(3) 4.5   (4) 5.41

15. The maximum energy that can be stored in a body due to external loading upto the elastic limit is called

(1) Resilience

(2) Proof resilience

(3) Strain energy

(4) Modulus of resilience

16. When steel is subjected to fatigue loading, the ratio of the endurance limit to the ultimate tensile strength is

(1) 0.50   (2) 0.35

(3) 0.65   (4) 0.20

17. A line shaft rotating at 200 rpm is to transmit 20 kW. The allowable shear stress of shaft material is 42 MPa. Neglecting the bending moment, the diameter of the shaft needs to be

(1) 35 mm   (2) 50 mm

(3) 65 mm   (4) 75 mm

18. The relation between equivalent length (L) and actual length (*l*) of a column whose one end is fixed and other end is hinged is given by

(1) $L = l$ (2) $L = l/2^{1/2}$

(3) $L = l/2$ (4) $L = 2l$

19. The ratio of the ultimate stress to the design stress is known as

(1) Elastic limit

(2) Strain

(3) Factor of safety

(4) Bulk modulus

20. Two shafts A and B under pure tension are of identical length and identical weight and are made of the same material. The shaft A is solid and the shaft B is hollow. We can say that

(1) Shaft B is better than shaft A

(2) Shaft A is better than shaft B

(3) Both the shafts are equally good

(4) Both the shafts are not good

21. A helical compression spring of stiffness K is cut into two pieces, each having equal number of turns and kept side-by-side under compression. The equivalent spring stiffness of this new arrangement is equal to

(1) 4K   (2) 2K

(3) K   (4) 0.5K

22. A circular shaft can transmit a torque of 5 kN-m. If the torque is reduced to 4 kN-m. then the maximum value of bending moment that can be applied to the shaft is

(1) 1 kN-m   (2) 2 kN-m

(3) 3 kN-m   (4) 4 kN-m

23. For obtaining a cup of diameter 20 mm and height 20 mm by drawing the size of the round blank should be approximately

(1) 35 mm   (2) 40 mm

(3) 45 mm   (4) 50 mm

24. A cup without flanges of 12 cm height and 3 cm diameter is to be made from a sheet metal of 2 mm thickness. The number of deductions necessary will be

(1) one   (2) two

(3) three   (4) four

25. Fabrication weldability test is used to determine

(1) mechanical properties required for satisfactory performance of weld

(2) susceptibility of welded joint for cracking

(3) susceptibility for joint design

(4) appropriate machining process

26. The extrusion process(es) used to make aluminium collapsible tube is/are

1. Tube extrusion

2. Forward extrusion

3. Impact extrusion

Select the correct answer using the codes given below :

(1) 1 only   (2) 1 and 2

(3) 2 and 3   (4) 3 only

□

27. Which one of the following processes is most commonly used for the forging of bolt heads of hexagonal shape ?
   (1) Closed die press forging
   (2) Closed die drop forging
   (3) Open die upset forging
   (4) Open die progressive forging

28. _____ type of oxy-acetylene flame tend to reduce its strength and ductility of weld metal and also make it more brittle.
   (1) Neutral   (2) Carburising
   (3) Oxidising   (4) All of these

29. Angle between the face and flank of the single point cutting tool is known as
   (1) Rake angle
   (2) Lip angle
   (3) Clearance angle
   (4) Point angle

30. An orthogonal cutting operation is being carried out under the following conditions :
   Cutting speed = 2 m/s; depth of cut = 0.5 mm; chip thickness = 0.6 mm. The chip velocity is
   (1) 1 m/s   (2) 1.66 m/s
   (3) 2 m/s   (4) 2.4 m/s

31. Crater wear starts at some distance from the tool tip because
   (1) cutting fluid cannot penetrate that region
   (2) stress on rake face is maximum at the region
   (3) tool strength is minimum at that region
   (4) tool temperature is maximum at that region

32. Feed rate for a cutting tool having nose radius of 1.8 mm and theoretical roughness of Rn = 5 μm is
   (1) 0.36 mm/rev
   (2) 0.187 mm/rev
   (3) 0.036 mm/rev
   (4) 0.0187 mm/rev

33. The process of hot extrusion is used to produce
   (1) Curtain rods made of aluminum
   (2) Stainless steel tubes used in furniture
   (3) Steel pipes/or domestic water supply
   (4) Large she pipes used in city water mains

34. Reduction in flat rolling is defined as
   (1) The ratio of original work thickness to final work thickness
   (2) The ratio of final work thickness to original work thickness
   (3) The ratio of draft to original work thickness
   (4) Difference in original work thickness and final work thickness

35. A PERT activity has an optimistic time estimate of 4 days, a pessimistic time estimate of 8 days and a most likely time estimate of 12 days. What is the expected time of the activity ?
   (1) 5 days   (2) 8 days
   (3) 10 days   (4) 12 days

36. Match List I (defect/trend) with List II (chart) and select the correct answer using the codes given below the lists.

List I	List II
A. Trend	1. R-chart
B. Dispersion	2. C-chart
C. Number of defects	3. X-chart
D. Number of defectives	4. np-chart

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

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

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

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

37. It is given that the actual demand is 61 units, a previous forecast 65 units and smoothening factor is 0.3. What will be the forecast for next period, using exponential smoothing ?

(1) 59.8   (2) 62.2

(3) 63.8   (4) 66.2

38. Speed and direction of workers' movements can be better recorded by which one of the following ?

(1) Flow chart

(2) Chronocycle graph

(3) Chronometer

(4) Flow diagram

39. In a PERT network, expected project duration is found to be 36 days from the start of the project. The variance is four days. The probability that the project will be completed in 36 days is

(1) Zero   (2) 34%

(3) 50%   (4) 84%

40. A company uses 2555 units for an item annually. Delivery lead time is 8 days. The reorder point (number of units) to achieve optimum inventory is

(1) 7   (2) 8

(3) 56   (4) 60

41. The process which determines the programme for the operations is called

(1) Loading   (2) Routing

(3) Dispatching   (4) Scheduling

42. In performing a task, motion economy refers to the manner in which

(1) Material movements can be reduced

(2) Machine movements can be reduced

(3) Human energy can be conserved

(4) Time consumed can be reduced

43. If 'F' is the fixed cost, 'V' is the variable cost per unit (or total variable costs) and 'P' is the selling price of each unit (or total sales value), then break-even point is equal to

(1) $(F \times V)/P$

(2) $(F \times P)/V$

(3) $F/[1 + (V/P)]$

(4) $F/P[1 - (V/P)]$

44. For a small scale industry, the fixed cost per month is ₹ 5000. The variable cost per product is ₹ 20 and sales price is ₹ 30 per piece. The break even production per month will be

(1) 300   (2) 460

(3) 500   (4) 1000

45. Which one of the following forecasting techniques is not suited for making forecast for planning production schedules in the short range ?

(1) Moving average

(2) Exponential moving average

(3) Regression analysis

(4) Delphi

46. Which of the following is not a material handling technique for productivity technique ?

(1) Work measurement

(2) Inventory control

(3) Quality control

(4) Materials management

47. A heat pump operates between the temperatures of 27 °C and − 13 °C. The rates of heat addition and heat rejection are 650 W and 900 W, respectively. The COP for the heat pump is

(1) 7.5   (2) 6.5

(3) 3.6   (4) 2.6

48. A gas turbine plant operates on Brayton cycle between T_{min} = 300 K and T_{max} = 1073 K. Find the maximum work done per kg of air (C_p = 1.005 kJ/kg-K)

(1) 27. 9 kJ/kg   (2) 239.5 kJ/kg

(3) 537.3 kJ/kg   (4) 776.8 kJ/kg

49. 'Bleeding' or 'Extracting' steam from the turbine at various points is done for the purpose of

(1) Reheating

(2) Regeneration

(3) Moisture removal

(4) Pressure reduction

50. The efficiency of superheat Rankine cycle is higher than that of simple Rankine cycle because

(1) the enthalpy of main steam is higher for superheat cycle

(2) the mean temperature of heat addition is higher for superheat cycle

(3) the temperature of steam in the condenser is high

(4) the quality of steam in the condenser is low

51. If steam is throttled, its

(1) Pressure and enthalpy remain unchanged

(2) Temperature and entropy remain unchanged

(3) Enthalpy remains unchanged but other property changes

(4) Enthalpy remains unchanged but pressure may or may not change

52. An engine operates between temperature limits of 900K and T_2 and another between T_2 and 200K. For both engine to have same efficiency, T_2 should be

(1) 552 K   (2) 320 K

(3) 424 K   (4) 350 K

53. The slope of sublimation curve on P-T diagram for all substances is
(1) Zero
(2) Infinity
(3) Positive
(4) Negative

54. The maximum possible work a system delivers as it undergoes a reversible process from the specified initial state to the state of its environment, (dead state) is
(1) Entropy
(2) Enthalpy
(3) Exergy
(4) Energy

55. The specific heat at constant pressure is _____ that of specific heat at constant volume.
(1) equal to
(2) less than
(3) more than
(4) None of these

56. The second law of thermodynamics defines
(1) Heat
(2) Work
(3) Entropy
(4) Internal Energy

57. With the increase in pressure
(1) The boiling point of water decreases and enthalpy of evaporation increases
(2) The boiling point of water increases and enthalpy of evaporation decreases
(3) Both the boiling point of water and enthalpy of evaporation decreases
(4) Both the boiling point of water and enthalpy of evaporation increases

58. The enthalpy of dry saturated steam _____ with the increase in pressure.
(1) decreases
(2) increases
(3) remains constant
(4) All of these

59. Which of the following factors increase detonation in the SI engine ?
1. Increased spark advance
2. Increased engine rpm
3. Increased compression ratio
Select the correct answer using the codes given below :
(1) 1 and 2
(2) 2 and 3
(3) 1 and 3
(4) 1, 2 and 3

60. In CI engines with increase in compression ratio the delay period
(1) first increases and then decreases
(2) increases
(3) decreases
(4) not affected

61. Morse test is applicable only to
(1) single cylinder SI engines
(2) single cylinder CI engines
(3) multi-cylinder CI engines
(4) single and multi-cylinder SI and CI engines

62. Supercharging increases the power output of the engine by
(1) increasing the charge temperature
(2) increasing the charge pressure
(3) increasing the speed of engine
(4) quality of fuel admitted

■

63. In a four stroke diesel engine, during suction stroke

(1) mixture of fuel and air is sucked

(2) only fuel is injected

(3) only air is sucked

(4) None of these

64. Scavenging is usually done to enhance

(1) Power output

(2) Thermal efficiency

(3) Speed

(4) Mechanical efficiency

65. The top ring nearest to the piston crown is known as

(1) Compression ring

(2) Oil ring

(3) Scrapper ring

(4) Grove ring

66. For a given weight and displacement, a well-designed two-stroke engine can provide significantly _____ power than its four-stroke counterpart.

(1) less

(2) equal

(3) more

(4) unpredictable

67. 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

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

(1) increase   (2) decrease

(3) remain same   (4) All of these

69. If the compression ratio of an engine working on Otto cycle is increased from 5 to 7, the percentage increase in efficiency will be

(1) 2   (2) 4

(3) 8   (4) 14

70. The following type of Lubrication system is used in two stroke engines :

(1) Petroil (mist) system

(2) Wet sump system

(3) Dry sump system

(4) All of these

71. 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) None of these

72. A small value of Biot number (Bi) implies that

(1) The convective resistance is large

(2) The conductive resistance is small

(3) Both The convective resistance is large and the conductive resistance is small

(4) None of these

73. Thermal radiations occur in the portion of electromagnetic spectrum between the wavelengths

(1) 10^{-2} to 10^{-4} micron

(2) 10^{-1} to 10^{-2} micron

(3) 0.1 to 100 micron

(4) 100 micron onwards

74. A thin shield of emissivity ε_3 (on both sides) is placed between two infinite parallel plates of emissivities ε_1 and ε_2, and temperatures T_1 and T_2 respectively. If $\varepsilon_1 = \varepsilon_2 = \varepsilon_3$ then the ratio of radiant energy transfer without shield to with shield will take the value

(1) 0.25   (2) 0.5

(3) 0.75   (4) 2

75. For which of these solid materials at room temperature, the thermal diffusivity is highest ?

(1) Copper

(2) Stainless Steel

(3) Alluminium

(4) Glass

76. In a typical central heating 'Radiator', approximately half the heat is transferred by

(1) Conduction   (2) Convection

(3) Radiation   (4) Evaporation

77. In natural convection, the ratio of thermal energy liberated by buoyancy to the energy dissipated by heat conduction and viscous drag is known as

(1) Nusselt number

(2) Grassoffs number

(3) Rayleigh number

(4) Prandtl number

78. Radiation heat transfer between two surfaces can be reduced greatly by inserting radiation shield with

(1) Greater thickness

(2) Low reflectivity

(3) High absorbivity

(4) Low emissivity

79. 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

80. The outer surface of a long cylinder is maintained at constant temperature. The cylinder does not has any heat source. The temperature in the cylinder will

(1) increase linearly with radius

(2) decrease linearly with radius

(3) be independent of radius

(4) vary logarithmically with radius

81. When all the condition are identical, in the case of flow through pipes with heat transfer, the velocity profile will be identical for

(1) liquid heating and liquid cooling

(2) gas heating and gas cooling

(3) liquid heating and gas cooling

(4) heating and cooling of any fluid

82. 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

83. If a Mohr circle is drawn for a fluid element inside a fluid body at rest, it would be

(1) a circle not touching the origin

(2) a circle touching the origin

(3) a point on the normal stress axis

(4) a point on the shear stress axis

84. Gas flows can often be approximated as incompressible if the mach number is

(1) equal to 1

(2) greater than 1

(3) less than 1 but greater than 0.3

(4) less than 0.3

85. A fluid of viscosity 1.5 Pa-s and relative density 0.9 flows through a circular pipe of diameter 5 cm with a maximum velocity of 1.2 m/s. The shear stress at the wall in Pa is

(1) 360   (2) 288

(3) 144   (4) 72

86. A hydraulic reaction turbine working under a head of 16 m develops 640 kW of power. What is the unit power of the turbine ?

(1) 10 kW   (2) 40 kW

(3) 60 kW   (4) 160 kW

87. The pressure that would be reached if the local flow is imagined to slow down to zero velocity frictionlessly is defined as

(1) Static pressure

(2) Stagnation pressure

(3) Dynamic pressure

(4) Kinematic pressure

88. Indicate the turbine that is most efficient at part load operation

(1) Pelton wheel   (2) Francis

(3) Kaplan   (4) Propeller

89. The drag due to tangential stresses on the surface is

(1) Pressure drag   (2) Friction drag

(3) Induced drag   (4) Form drag

90. The concept of _____ thickness is used in the design of ducts, intakes of air-breathing engines, wind tunnels, etc. by first assuming a frictionless flow and then enlarging the passage walls by this thickness so as to allow the same flow rate.

(1) u=0.99U   (2) Displacement

(3) Momentum   (4) Friction

91. Newton's law of viscosity depend upon the

(1) Stress and strain in a fluid

(2) Shear stress, Pressure and velocity

(3) Shear stress and rate of strain

(4) Viscosity and shear stress

92. The capillary rise or depression in a small diameter tube is

(1) Directly proportional to the specific weight of the fluid

(2) Inversly proportional to the surface tension

(3) Inversly proportional to the diameter

(4) Directly proportional to the surface area

93. In a stream line steady flow, two points A and B on a stream line are 1m apart and the flow velocity varies from 2m/s to 5 m/s. What is the acceleration of fluid at B in meter per second square?

(1) 3   (2) 6

(3) 9   (4) 15

94. A uniform body 3 m long , 2m wide and 1m deep floats in water. If the depth of immersion is 0.6 m then the weight of the body is

(1) 3.53 KN   (2) 33.53 KN

(3) 35.3 KN   (4) 3.35 KN

95. In a psychrometric process, the sensible heat added is 40 kJ/sec and the latent heat added is 20 kJ/sec. The sensible heat factor for the process will be

(1) 0.3   (2) 0.6

(3) 0.67   (4) 1.5

96. In ammonia-water and lithium bromide-water absorption refrigeration systems the absorbents are, respectively

(1) ammonia and water

(2) water and water

(3) ammonia and lithium bromide

(4) water and lithium bromide

97. Enriched uranium is required as a fuel in a nuclear reactor, if light water is used as a coolant and a moderator, because light water has

(1) high neutron absorption cross-section

(2) low moderating efficiency

(3) low neutron absorption cross-section

(4) high neutron scatter cross-section

98. In high pressure natural circulation boilers, the flue gas flow through the following boiler accessories.
   1. Superheater
   2. Air heater
   3. Economiser
   4. ID fan

   The correct sequence of the flow of flue gases through these boiler accessories is :
   (1) 1, 3, 4, 2
   (2) 3, 1, 4, 2
   (3) 3, 1, 2, 4
   (4) 1, 3, 2, 4

99. If an engine of 40% thermal efficiency drives a refrigerator having a coefficient of performance of 5, then the heat input to engine for each kJ of heat removed from the cold body of the refrigerator is
   (1) 0.50 kJ
   (2) 0.75 kJ
   (3) 1 kJ
   (4) 1.25 kJ

100. As relative humidity decreases, the dew point will be
   (1) lower than WBT
   (2) equal to WBT
   (3) higher than WBT
   (4) unpredictable

101. Reactors designed for propulsion applications uses
   (1) Natural uranium
   (2) Any uranium
   (3) Pure uranium
   (4) Enriched uranium

102. A hydraulic turbine develops 1000 kW power for a head of 40 m. If the head is reduced to 20 m, the power developed (in kW) is
   (1) 177
   (2) 354
   (3) 500
   (4) 707

103. In a vapour compression refrigeration cycle for making ice, the condensing temperature for higher COP
   (1) should be near the critical temperature of the refrigerant
   (2) should be above the critical temperature of the refrigerant
   (3) should be much below the critical temperature of the refrigerant
   (4) could be of any value as it does not affect the COP

104. 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

105. The draught in locomotive boilers is produced by
   (1) Chimney
   (2) Centrifugal fan
   (3) Steam jet
   (4) Locomotion

106. In the expansion valve of a refrigerator, the following property remains constant :
   (1) Entropy
   (2) Enthalpy
   (3) Internal energy
   (4) Product PV

107. A steel cantilever beam of length 900 cm has moment of inertia 0.0002 m⁴. A mass of 10 kg is attached to the free end of the beam. If the mass is displaced slightly and released. The natural frequency of the system. Consider $E = 50$ GPa

(1) 2028.60 rad/sec

(2) 256.60 rad/sec

(3) 202.86 rad/sec

(4) 64.15 rad/sec

108. Consider the following statements :

Coriolis acceleration component appears in the acceleration analysis of the following planar mechanisms :

1. Quick return mechanism

2. Slider-crank mechanism

3. Scotch-Yoke mechanism

Which of these statements is/are correct ?

(1) 1 only   (2) 1 and 3

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

109. In which of the following case, the turning moment diagram will have largest variations ?

(1) Single Cylinder Two Stroke Engine

(2) Four Stroke Single Cylinder Engine

(3) Four Cylinder Four Stroke Engine

(4) Six Cylinder Four Stroke Engine

110. A uniform disc (Diameter d = 150 mm, m = 5 kg) is mounted centrally on a horizontal shaft as shown in Fig. which runs in bearings (A and B) which are 10 cm apart. The disc spins, in the direction shown in the Fig, with a uniform speed of 1000 rpm. The shaft precesses with a uniform velocity of 60 rpm in the horizontal plane in the anti-clockwise direction when looking from top.

The magnitude of total reaction (i.e. static + dynamic) at bearing B will be
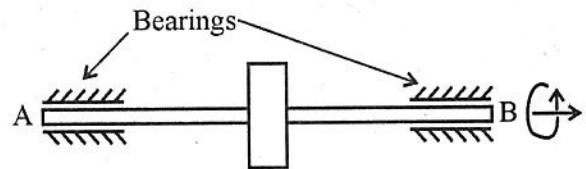
(1) 21.5 N   (2) 67.96 N

(3) 92 N   (4) 117 N

111. The smallest circle that can be drawn from the centre of the cam and tangent to the pitch curve is known as

(1) Base circle   (2) Pitch circle

(3) Prime circle   (4) Profile circle

112. A pinion and gear are in mesh with a gear ratio of 2. The moment of inertias of the pinion and gear are 3 kg m² and 5 kg m² respectively. For the pinion to have an angular acceleration of 4 rad/s², the torque to be applied to the pinion shaft is

(1) 5 N-m   (2) 10 N-m

(3) 14 N-m   (4) 17 N-m

113. The flywheel of a steam engine has a radius of gyration of 1 m and mass 2500 kg. The starting torque of the steam engine is 1500 N-m and may be assumed constant. The angular acceleration of the flywheel is

(1) 1.6 rad/s^2 (2) 0.4 rad/s^2

(3) 0.6 rad/s^2 (4) 1.0 rad/s^2

114. A cantilever shaft 50 mm diameter and 300 mm long has a disc of mass 100 kg at its free end. The Young's modulus for the shaft material is 200 GN/m^2. The frequency of longitudinal vibrations of the shaft will be

(1) 57.5 Hz   (2) 575 Hz

(3) 5.75 Hz   (4) 41 Hz

115. An involute pinion and gear are in mesh. If both have the same size of addendum, then there will be an interference between the

(1) Tip of the gear tooth and flank of pinion

(2) Tip of the pinion and flank of gear

(3) Flanks of both gear and pinion

(4) Tip of both gear and pinion

116. In a gear train, when the axes of the shafts, over which the gears are mounted, move relative to a fixed axis, is called

(1) Simple gear train

(2) Compound gear train

(3) Reverted gear train

(4) Epicyclic gear train

117. The air screw of an aeroplane is rotating clockwise when looking from the front. If it makes a left turn, the gyroscopic effect will

(1) Tend to depress the nose and raise the tail

(2) Tend to raise the nose and depress the tail

(3) Tilt the aeroplane

(4) None of these

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

(1) 5367 r.p.m.   (2) 6000 r.p.m.

(3) 9360 r.p.m.   (4) 12000 r.p.m.

119. Gun metal used in journal bearings, contains

(1) 88% Cu, 10% Sn, 2% Zn

(2) 80% Cu, 10% Zn, 10% Al

(3) 85% Cu, 5% Mg, 10% Al

(4) 85% Cu, 5% Sn, 10% Pb

120. A screw dislocation

1. lies parallel to its Burger's vector

2. lies perpendicular to its Burger's vector

3. moves in perpendicular direction to the Burger's vector

4. moves in an inclined direction to the Burger's vector

Select the correct answer using the codes given below :

(1) 1 and 4   (2) 1 and 3

(3) 2 and 3   (4) 2 and 4