

पुस्तिका में पृष्ठों की संख्या : 16
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प्रश्न-पत्र पुस्तिका संख्या /
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अधिकतम अंक : 100
Maximum Marks : 100

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 वीक्षक से दूसरा प्रश्न-पत्र प्राप्त कर लें। ऐसा न करने पर जिम्मेदारी अभ्यर्थी की होगी।

The candidate should ensure that Question Paper Booklet No. of the Question Paper Booklet and Answer Sheet must be same after opening the Paper Seal / Polythene bag. In case they are different, a candidate must obtain another Question Paper. 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 अन्दर रखा है। जब आपको परीक्षा पुस्तिका खोलने को कहा जाए, तो उत्तर पत्र निकाल कर ध्यान से केवल नीले बॉल प्वाइंट 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 प्राप्ताकों 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.



1. The enthalpy of vaporization, at critical point is

- (1) maximum
- (2) minimum
- (3) zero
- (4) none of the above

2. Angle made by the absolute velocity of steam to the horizontal is called as

- (1) blade entrance angle
- (2) nozzle angle
- (3) outlet angle
- (4) none of the mentioned

3. The point that connects the saturated-liquid line to the saturated-vapour line is called the

- (1) triple point
- (2) critical point
- (3) superheated point
- (4) compressed liquid point

4. The velocity along the radius of a pipe of 0.1 m radius varies as $u = 10 \times [1 - (r/0.1)^2]$ m/s. The viscosity of the fluid is 0.02 Ns/m². The maximum value shear stress in N/m² is

- (1) -4
- (2) -4.5
- (3) -6
- (4) -8

5. The reading of the pressure gauge fitted on a vessel is 25 bar. The atmospheric pressure is 1.03 bar and the value of g is 9.81 m/s². The absolute pressure in the vessel is :

- (1) 23.97 bar
- (2) 25.00 bar
- (3) 26.03 bar
- (4) 34.84 bar

6. A steel rod 10 mm in diameter and 1 m long is heated from 20 °C to 120 °C, $E = 200$ GPa and $\alpha = 12 \times 10^{-6}$ per °C. If the rod is not free to expand, the thermal stress developed is :

- (1) 120 MPa (tensile)
- (2) 240 MPa (tensile)
- (3) 120 MPa (compressive)
- (4) 240 MPa (compressive)

7. In steady state conduction with thermal conductivity given by $k = k_0(1 + \beta T)$ where β , is + ve, a slab of given thickness and given temperature drop will conduct

- (1) more heat at lower temperature levels
- (2) more heat at higher temperature levels
- (3) same heat as flow depends on the temperature drop
- (4) same heat as flow depends on the thickness only

8. Which of the following refrigerant has the maximum ozone depletion in the stratosphere ?
- (1) Ammonia
 - (2) Carbon dioxide
 - (3) Sulphur dioxide
 - (4) Fluorine
9. Air is compressed in a cylinder such that the volume changes from 0.2 to 0.02 m³. The initial pressure is 200 kPa. If the pressure is constant, the approximate work is
- (1) -36 kJ
 - (2) -40 kJ
 - (3) -46 kJ
 - (4) -52 kJ
10. For air standard Brayton cycle, increase in the maximum temperature of the cycle, while keeping the pressure ratio is same would result in
- (1) Increase in air standard efficiency
 - (2) Decrease in air standard efficiency
 - (3) No change in air standard efficiency
 - (4) Increase in the efficiency but reduction in net work
11. Which one of the following is the correct sequence of the position of the given components in a turboprop ?
- (1) Propeller, Compressor, Turbine, Burner
 - (2) Compressor, Propeller, Burner, Turbine
 - (3) Propeller, Compressor, Burner, Turbine
 - (4) Compressor, Propeller, Turbine, Burner
12. Cavitation cannot occur in
- (1) Francis turbine
 - (2) centrifugal pump
 - (3) piston pump
 - (4) Pelton wheel
13. A sample of ideal gas has an internal energy U and is then compressed to one-half of its original volume while the temperature stays the same. What is the new internal energy of the ideal gas in terms of U ?
- (1) U
 - (2) $\frac{1}{2}U$
 - (3) $\frac{1}{4}U$
 - (4) $2U$
14. In a steam power plant, the ratio of the isentropic heat drop in the prime mover to the amount of heat supplied per unit mass of steam is known as
- (1) Stage efficiency
 - (2) degree of reaction
 - (3) Rankine efficiency
 - (4) relative efficiency

15. The essential function of the carburettor in a spark ignition engine is to :

- (1) Meter the fuel into air stream and amount dictated by the load and speed
- (2) Bring about mixing of air and fuel to get a homogeneous mixture
- (3) Vaporise the fuel
- (4) Distribute fuel uniformly to all cylinders in a multi cylinder engine and also vaporise it.

16. A 120-V electric resistance heater draws 10 A. It operates for 10 min in a rigid volume. Calculate the work done on the air in the volume.

- (1) 720 000 kJ (2) 720 kJ
- (3) 12 000 J (4) 12 kJ

17. An inventor claims a thermal engine operates between ocean layers at 27°C and 10°C . It produces 10 kW and discharges 9900 kJ/min. Such an engine is

- (1) Impossible (2) Reversible
- (3) Possible (4) Probable

18. The colour of the flame of halide torch, in case of leakage of Freon refrigerant, will change to

- (1) bright green (2) yellow
- (3) red (4) orange

19. Roots blower is an example of

- (1) Reciprocating (positive displacement) compressor
- (2) Rotary (positive displacement) compressor
- (3) Centrifugal compressor
- (4) Axial compressor

20. In thermal power plants, the deaerator is used mainly to

- (1) Remove air from condenser
- (2) Reduce steam pressure
- (3) Increase feed water temperature
- (4) Remove dissolved gases from feed water.

21. A Carnot refrigerator works between the temperatures of 200 K and 300 K. If the refrigerator receives 1 kW of heat, the work requirement will be :

- (1) 0.5 kW (2) 0.67 kW
- (3) 1.5 kW (4) 3 kW

22. In a lithium bromide absorption refrigeration system

- (1) lithium bromide is used as a refrigerant and water as an absorbent
- (2) water is used as a refrigerant and lithium bromide as an absorbent
- (3) ammonia is used as a refrigerant and lithium bromide as an absorbent
- (4) none of the above

23. Two long parallel plates of same emissivity 0.5 are maintained at different temperatures and have radiation heat exchange between them. The radiation shield of emissivity 0.25 placed in the middle will reduce radiation heat exchange to :
- (1) $1/2$ (2) $1/4$
(3) $3/10$ (4) $3/5$
24. Two radiating surfaces $A_1 = 6 \text{ m}^2$ and $A_2 = 4 \text{ m}^2$ have the shape factor $F_{1-2} = 0.1$; the shape factor F_{2-1} will be :
- (1) 0.18 (2) 0.15
(3) 0.12 (4) 0.10
25. The design calculations for members subject to fluctuating loads with the same factor of safety yield the most conservative estimates when using
- (1) Gerber relation
(2) Soderberg relation
(3) Goodman relation
(4) None of the above
26. The continuity equation is satisfied by
- (1) $u = A \sin xy, v = -A \sin xy$
(2) $u = x + y, v = x - y$
(3) $u = 2x^2 + cy, v = 3y^2$
(4) $u = x + 2y, v = 2x + y$
27. In a steady flow along a stream line at a location in the flow, the velocity head is 6 m, the pressure head is 3 m, and the potential head is 4 m. The height of hydraulic gradient line at this location will be
- (1) 13 m (2) 9 m
(3) 10 m (4) 7 m
28. A gas turbine plant working on Joule cycle produces 4000 kW of power. If its work ratio is 40%, what is the power consumed by the compressor ?
- (1) 2000 kW (2) 4000 kW
(3) 6000 kW (4) 8000 kW
29. In a counter flow heat exchanger, cold fluid enters at 30°C and leaves at 50°C , whereas hot fluid enters at 150°C and leaves at 130°C . The mean temperature difference for this case is :
- (1) Indeterminate (2) 20°C
(3) 80°C (4) 100°C
30. The boundary layer thickness in laminar flow is proportional to
- (1) $Re^{0.2}$ (2) $Re^{0.5}$
(3) $Re^{-0.5}$ (4) $Re^{-0.2}$

31. If the size of a standard specification for fatigue testing machine is increased, then endurance limit for the material will

- (1) Have same value as that of standard specification
- (2) Increase
- (3) Decrease
- (4) None of these

32. Velocity of flame propagation in the SI engine is maximum for a fuel-air mixture which is

- (1) 10% richer than stoichiometric
- (2) Equal to stoichiometric
- (3) More than 10% richer than stoichiometric
- (4) 10% leaner than stoichiometric

33. Usually fins are provided to increase the rate of heat transfer. But fins also act as insulation. Which one of the following non-dimensional numbers decides this factor ?

- (1) Eckert number
- (2) Biot number
- (3) Fourier number
- (4) Peclet number

34. Nucleate boiling is promoted

- (1) on polished surfaces
- (2) on rough surfaces
- (3) in the absence of agitation
- (4) none of these

35. A beam carrying a uniformly distributed load rests on two supports 'b' apart with equal overhang 'a' at each end. The ratio b/a for zero bending moment at the mid span is

- (1) 1/2
- (2) 1
- (3) 3/2
- (4) 2

36. A cantilever beam of length L is subjected to an on concentrated load P at a distance of L/3 from free end, what is the deflection at free end of the beam ?

- (1) $\frac{2PL^3}{81EI}$
- (2) $\frac{3PL^3}{81EI}$
- (3) $\frac{14PL^3}{81EI}$
- (4) $\frac{15PL^3}{81EI}$

37. Constant pressure lines in the superheated region of the Mollier diagram have what type of slope ?

- (1) A positive slope
- (2) A negative slope
- (3) Zero slope
- (4) May have either positive or negative slopes

38. In a four bar linkage, the sum of the length of the smallest and longest link is less than the sum of the length of the other two links. If the smallest link is fixed, the linkage becomes
- (1) Structure
 - (2) Double rocker
 - (3) Double crank mechanism
 - (4) Crank – rocker mechanism
39. Which one of the following is an exact straight-line mechanism using lower pairs ?
- (1) Watt's mechanism
 - (2) Grasshopper mechanism
 - (3) Robert's mechanism
 - (4) Peaucellier's mechanism
40. A Column of rectangular section ($I_{xx} > I_{yy}$) is subject to an axial load. What is the axis about which the column will have a tendency to buckle ?
- (1) X - X
 - (2) Y - Y
 - (3) The diagonal of the section
 - (4) X-X or Y-Y axis without any preference
41. The direction of linear velocity of any point on a link with respect to another point on the same link is
- (1) parallel to the link joining the points
 - (2) at 45° to the link joining the points
 - (3) perpendicular to the link joining the points
 - (4) none of these
42. The design of piston head is based on,
- (1) strength and rigidity considerations
 - (2) bending and torsional moments
 - (3) buckling consideration
 - (4) strength and heat transfer considerations
43. Petroff's equation is used to find out
- (1) load carrying capacity of the bearing
 - (2) frictional losses in the bearing
 - (3) unit bearing pressure on the bearing
 - (4) pressure distribution around the periphery of the journal
44. Under logarithmic decrement, the amplitude of successive vibrations are
- (1) constant
 - (2) in arithmetic progression
 - (3) in geometric progression
 - (4) in logarithmic progression

45. The object of caulking in a riveted joint is to make the joint
- (1) free from corrosion
 - (2) stronger in tension
 - (3) free from stress
 - (4) leak proof
46. In a turning moment diagram, the variations of energy above and below the mean resisting torque line is called
- (1) fluctuation of energy
 - (2) maximum fluctuation of energy
 - (3) coefficient of fluctuation of energy
 - (4) none of the above
47. The point of contraflexure occurs in
- (1) Cantilever beam only
 - (2) Simply supported beam only
 - (3) Overhanging beam only
 - (4) Continuous beam only
48. The Hoop stresses are acting across the
- (1) Circumferential section
 - (2) Longitudinal section
 - (3) Radial section
 - (4) None of the above

49. A motor car moving at a certain speed takes a left turn in a curved path. If the engine rotates in the same direction as that of wheels, then due to the centrifugal forces
- (1) the reaction on the inner wheels increases and on the outer wheels decreases
 - (2) the reaction on the outer wheels increases and on the inner wheels decreases
 - (3) the reaction on the front wheels increases and on the rear wheels decreases
 - (4) the reaction on the rear wheels increases and on the front wheels decreases
50. The ratio of lateral strain to linear strain is known as
- (1) Modulus of elasticity
 - (2) Modulus of rigidity
 - (3) Poisson's ratio
 - (4) Elastic limit
51. In fillet welded joint, the throat of weld as compared to the size of weld is
- (1) about 0.5 times
 - (2) about 0.707 times
 - (3) about same size
 - (4) about $\sqrt{2}$ times

52. Deep groove ball bearings are used for
- (1) heavy thrust load
 - (2) small angular displacement of shafts
 - (3) radial load at high speed
 - (4) combined thrust and radial load at high speed
53. If the air screw of an aeroplane rotates clockwise when viewed from the rear and the aeroplane takes a right turn, the gyroscopic effect will
- (1) Tend to raise the tail and depress the nose
 - (2) Tend to raise the nose and depress the tail
 - (3) Tilt the aero lane about spin axis
 - (4) None of above
54. The critical speed of a shaft is affected by the
- (1) Diameter and the eccentricity of the shaft
 - (2) Span and the eccentricity of the shaft
 - (3) Diameter and the span of the shaft
 - (4) Span of the shaft
55. The factor of safety for machine parts subjected to reversed stresses is
- (1) ratio of yield strength to maximum stress
 - (2) ratio of endurance limit to amplitude stress
 - (3) ratio of ultimate tensile strength to maximum stress
 - (4) ratio of endurance limit to mean stress
56. If the number of teeth on the wheel rotating at 300 r.p.m. is 90, then the number of teeth on the mating pinion rotating at 1500 r.p.m. is
- | | |
|--------|--------|
| (1) 15 | (2) 18 |
| (3) 20 | (4) 60 |
57. A steel bar of 40 mm × 40 mm square cross-section is subjected to an axial compressive load of 200 kN. If the length of the bar is 2 m and $E = 200$ GPa, the elongation of the bar will be :
- | | |
|-------------|-------------|
| (1) 1.25 mm | (2) 2.70 mm |
| (3) 4.05 mm | (4) 5.40 mm |
58. A rectangular plate in plane stress is subjected to normal stresses $\sigma_x = 35$ MPa, $\sigma_y = 26$ MPa, and shear stress $\tau_{xy} = 14$ MPa. The ratio of the magnitudes of the principal stresses (σ_1/σ_2) is approximately :
- | | |
|---------|---------|
| (1) 0.8 | (2) 1.5 |
| (3) 2.1 | (4) 2.9 |

59. In a screw jack, the effort required to lift the load W is given by (where α = Helix angle, and ϕ = Angle of friction.)

(1) $P = W \tan(\alpha - \phi)$

(2) $P = W \cos(\alpha - \phi)$

(3) $P = W \tan(\alpha + \phi)$

(4) $P = W \cos(\alpha + \phi)$

60. When a circular shaft is subjected to torque, the torsional shear stress is

(1) maximum at the axis of rotation and zero at the outer surface

(2) uniform from axis of rotation to the outer surface

(3) zero at the axis of rotation and maximum at the outer surface

(4) zero at the axis of rotation and zero at the outer surface and maximum at the mean radius

61. The permissible stress in a fillet weld is 100 N/mm^2 . The fillet weld has equal leg lengths of 15 mm each. The allowable shearing load on weldment per cm length of the weld is

(1) 22.5 kN (2) 15.0 kN

(3) 10.6 kN (4) 7.5 kN

62. A cast iron designated by FG300 is,

(1) grey cast iron with carbon content of 3%

(2) grey cast iron with ultimate tensile strength of 300 N/mm^2

(3) grey cast iron with ultimate compressive strength of 300 N/mm^2

(4) grey cast iron with tensile yield strength of 300 N/mm^2

63. In under-damped vibration system, the amplitude of vibration

(1) decreases linearly with time

(2) increases linearly with time

(3) decreases exponentially with time

(4) increases exponentially with time

64. The frictional torque transmitted by a cone clutch is same as that of

(1) Flat pivot bearing

(2) Conical pivot bearing

(3) Flat collar bearing

(4) Trapezoidal pivot bearing

65. 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 . Determine Angular acceleration of the flywheel.

(1) 0.8 rad/s^2 (2) 0.6 rad/s^2

(3) 0.9 rad/s^2 (4) 1.6 rad/s^2

66. In time study, the rating factor is applied to determine
- (1) standard time of a job
 - (2) merit rating of the worker
 - (3) fixation of incentive rate
 - (4) normal time of a worker
67. PERT requires
- (1) single time estimate
 - (2) double time estimate
 - (3) triple time estimate
 - (4) none of these
68. Cold shut is a forging defect caused by which of the following reason ?
- (1) Improper cleaning of the stock
 - (2) Improper design of die
 - (3) Misalignment of the two die halves
 - (4) Improper cooling of the large forging
69. Keeping all other parameters unchanged, the tool wear in electrical discharge machining would be less if the tool material has
- (1) High thermal conductivity and high specific heat
 - (2) High thermal conductivity and low specific heat
 - (3) Low thermal conductivity and low specific heat
 - (4) Low thermal conductivity and high specific heat
70. When a doctor attends to an emergency case leaving his regular service is called :
- (1) Reneging
 - (2) Balking
 - (3) Pre-emptive queue discipline
 - (4) Non-Pre-Emptive queue discipline
71. SIRO discipline is generally found in
- (1) Loading and unloading
 - (2) Office filing
 - (3) Lottery draw
 - (4) Train arrivals at platform
72. A block of length 200 mm is machined by a slab milling cutter 34 mm in diameter. The depth of cut and table feed are set at 2 mm and 18 mm/minute, respectively. Considering the approach and the over travel of the cutter to be same, the minimum estimated machining time (minutes) per pass is
- | | |
|--------|--------|
| (1) 12 | (2) 10 |
| (3) 11 | (4) 15 |
73. Piston compression rings are made of
- | | |
|---------------|-----------------|
| (1) Cast iron | (2) Bronze |
| (3) Aluminium | (4) White metal |

74. For sales forecasting, pooling of expert opinions is made use of in

- (1) Statistical correlation
- (2) Delphi technique
- (3) Moving average method
- (4) Exponential smoothing

75. The most suitable system for a retail shop is

- (1) FSN Analysis
- (2) ABC Analysis
- (3) VED Analysis
- (4) GOLF Analysis

76. Production scheduling is simpler, and high volume of output and high labour efficiency are achieved in the case of :

- (1) Fixed position layout
- (2) Process layout
- (3) Product layout
- (4) A combination of line and process layout

77. In a 6×6 transportation problem, degeneracy would arise, if the number of filled slots were :

- (1) Equal to thirty six
- (2) More than twelve
- (3) Equal to twelve
- (4) Less than eleven

78. In queue designation A/B/S : (d/f), what does S represent ?

- (1) Arrival Pattern
- (2) Service Pattern
- (3) Number of service channels
- (4) Capacity of the system

79. In CPM network, critical path denotes the

- (1) Path where maximum resources are used.
- (2) Path where minimum resources are used.
- (3) Path where delay of one activity prolongs the duration of completion of project.
- (4) Path that gets monitored automatically.

80. Crater wear occurs mainly on the
- (1) nose part, front relief face and side relief face of the cutting tool
 - (2) cutting edge only
 - (3) front face only
 - (4) face of the cutting tool at a short distance from the cutting edge only

81. In the EOQ model, if the unit ordering cost is doubled, the EOQ
- (1) is halved
 - (2) is doubled
 - (3) increases 1.414 times
 - (4) decreases 1.414 times

82. During the execution of a CNC part program block NO20 GO2 X45.0 Y25.0 R5.0 the type of tool motion will be
- (1) circular Interpolation – clockwise
 - (2) circular Interpolation – counter clockwise
 - (3) linear Interpolation
 - (4) rapid feed

83. On heating, one solid phase results in another solid phase and a liquid phase during _____ reaction.
- (1) Eutectoid
 - (2) Peritectic
 - (3) Eutectic
 - (4) Peritectoid

84. The distribution of arrivals in a queuing system can be considered as a
- (1) Death process
 - (2) Pure birth process
 - (3) Pure live process
 - (4) Sick process

85. According to Indian Standard, 50 H8-g7 means
- (1) upper limit is (50+8) mm and lower limit (50-7) mm
 - (2) designation of tolerance with basic size 50 mm
 - (3) designation of fit of two parts with basic size 50 mm
 - (4) None of above

86. If the primal has an unbounded solution, then the dual has
- (1) Optimal solution
 - (2) No solution
 - (3) Bound solution
 - (4) None of the above

87. What is the equivalent thermal conductivity of a composite wall made up of two layers of different materials of thermal conductivities k_1 and k_2 and having thicknesses of δ_1 and δ_2 respectively ?

- (1) $\frac{2(k_1 + k_2)}{\delta_1 + \delta_2}$
 (2) $\frac{(k_1 + k_2)}{k_1 k_2} \times \frac{\delta_1 \delta_2}{\delta_1 + \delta_2}$
 (3) $\frac{k_1 k_2 (\delta_1 + \delta_2)}{k_1 \delta_1 + k_2 \delta_2}$
 (4) $\left(\frac{k_1}{\delta_1}\right) + \left(\frac{k_2}{\delta_2}\right)$

88. The non-dimensional parameter known as Stanton number (St) is used in

- (1) Forced convection heat transfer in flow over flat plate.
 (2) Condensation heat transfer with laminar film layer.
 (3) Natural convection heat transfer over flat plate.
 (4) Unsteady heat transfer from bodies in which internal temperature gradient cannot be neglected.

89. A steel ball of mass 1 kg and specific heat 0.4 kJ/kg °C is at a temperature of 60 °C. It is dropped into 1 kg water at 20 °C. The final steady state temperature of water is :

- (1) 23.5 °C (2) 30 °C
 (3) 35 °C (4) 40 °C

90. Thermal conductivity of copper with rise in temperature

- (1) Decrease
 (2) Increase
 (3) Remains constant
 (4) None of these

91. For completely dry air total heat is

- (1) Total latent heat
 (2) Sum of latent heat and sensible heat
 (3) Total sensible heat
 (4) Difference of sensible heat and latent heat

92. A refrigerator working on a reversed Carnot cycle absorb 10 kW power and has a COP of 4. What will be the quantity of heat delivered to a building if it works as a heat pump ?

- (1) 30 kW (2) 40 kW
 (3) 50 kW (4) 60 kW

93. What is the value of shape factor for two infinite parallel surfaces separated by a distance X ?

- (1) 0 (2) Infinite
 (3) 1 (4) X

94. Which of the following statement does not apply to the volumetric efficiency of a reciprocating air compressor ?

- (1) It decrease with increase of inlet temperature.
- (2) It increase with decrease of pressure ratio
- (3) It increase of decrease in clearance ratio
- (4) It decrease with increase in clearance to stroke ratio

95. The efficiency of superheated Rankine cycle is higher than that of simple Rankine cycle because

- (1) The enthalpy of main steam is lower for super heat cycle.
- (2) The mean temperature of heat addition is higher for super heat cycle.
- (3) The temperature of steam in condenser is high.
- (4) The quality of steam in condenser is low.

96. In a domestic refrigerator, periodic defrosting is required because frosting

- (1) Causes corrosion of material
- (2) Reduce heat extraction
- (3) Over cools food stuff
- (4) Partially blocks refrigerant flow

97. The change in enthalpy of a closed system is equal to the heat transferred, if the reversible process takes place at constant

- (1) Temperature (2) Pressure
- (3) Volume (4) Entropy

98. The critical depth meter is used to measure

- (1) Velocity of flow in an open channel
- (2) Depth of flow in an open channel
- (3) Depth of channel
- (4) Hydraulic jump

99. Up to critical radius of insulation,

- (1) added insulation will increase heat loss
- (2) added insulation will decrease heat loss
- (3) convective heat loss will be less than conductive heat loss
- (4) heat flux will decrease

100. The application of centrifugal compressor in aircraft leads to

- (1) Large frontal area of aircraft
- (2) Higher flow rate through the engine
- (3) Higher aircraft speed
- (4) Lower frontal area of aircraft

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