

पुस्तिका में पृष्ठों की संख्या-16
No. of pages in Booklet -16
पुस्तिका में प्रश्नों की संख्या-100
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Subject Code - 04

NEAP-81

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Question Paper Booklet No.
प्रश्न-पत्र पुस्तिका संख्या

विषय/ SUBJECT : **Mechanical
Engineering**

PAPER-II

समय : 2.00 घण्टे
Time: 2.00 Hours

अधिकतम अंक : 200
Maximum Marks: 200

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 from the Invigilator. Candidate himself shall be responsible for ensuring this.

परीक्षार्थियों के लिए निर्देश

- सभी प्रश्नों के उत्तर दीजिए।
- सभी प्रश्नों के अंक समान हैं।
- प्रत्येक प्रश्न का केवल एक ही उत्तर दीजिए।
- एक से अधिक उत्तर देने की दशा में प्रश्न के उत्तर को गलत माना जाएगा।
- 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।
- OMR उत्तर पत्रक इस परीक्षा पुस्तिका के साथ 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। OMR उत्तर पत्र पर प्रश्न-पत्र पुस्तिका संख्या ध्यानपूर्वक भरें।
- 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।
- 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।
- कृपया अपना रोल नम्बर ओ.एम.आर. पत्रक पर सावधानीपूर्वक सही भरें। गलत अथवा अपूर्ण रोल नम्बर भरने पर 5 अंक कुल प्राप्तियों में से काटे जा सकते हैं।
- यदि किसी प्रश्न में किसी प्रकार की कोई मुद्रण या तथ्यात्मक प्रकार की त्रुटि हो तो प्रश्न के हिन्दी तथा अंग्रेजी रूपान्तरों में से अंग्रेजी रूपान्तर मान्य होगा।

चेतावनी: अगर कोई अभ्यर्थी नकल करते पकड़ा जाता है या उसके पास से कोई अनधिकृत सामग्री पाई जाती है, 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

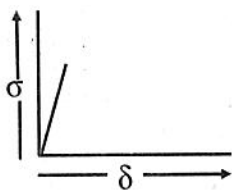
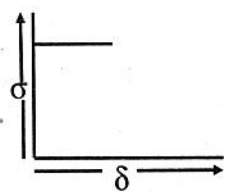
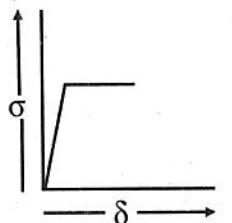
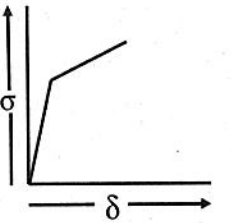
- Answer **all** questions.
- All** questions carry equal marks.
- Only **one** answer is to be given for each question.
- If more than one answers are marked, it would be treated as wrong answer.
- Each question has four alternative responses marked serially as **1, 2, 3, 4**. You have to darken only one circle or bubble indicating the correct answer on the Answer Sheet using **BLUE BALL POINT PEN**.
- The OMR Answer Sheet is kept with 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**. **Please fill the Question Paper Booklet no. on the OMR Answer Sheet carefully.**
- 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.)
- 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.
- Please correctly fill your Roll Number in O.M.R. Sheet. **5 Marks** can be deducted for filling wrong or incomplete Roll Number.
- If there is any sort of ambiguity/mistake either of printing or factual nature then out of Hindi and English Version of the question, the English Version will be treated as standard.

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 be 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।

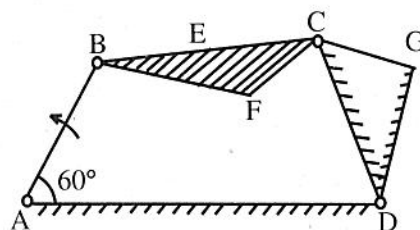
Do not open this Test Booklet until you are asked to do so.

MECHANICAL ENGINEERING

- Which of the following mechanism generates intermittent rotary motion from continuous rotary motion?
 - (1) Scotch yoke mechanism
 - (2) Geneva mechanism
 - (3) Elliptical trammel
 - (4) Whitworth mechanism
- A slider moving in a curve surface will have its instantaneous center -
 - (1) at their point of contact
 - (2) at infinity
 - (3) at the center of curvature
 - (4) anywhere on the curve surface
- A planar linkage having 8 links and 9 joints of single degree of freedom will have..... degree of freedom.
 - (1) 1
 - (2) 2
 - (3) 3
 - (4) 4
- In two spur gears in mesh having involute profiles, the line of action is tangential to -
 - (1) pitch circle
 - (2) base circle
 - (3) addendum circle
 - (4) dedendum circle
- A slider moving at 150 mm/s on a link rotating at 60 rpm will have.....Coriolis acceleration.
 - (1) $600\pi \text{ mm/s}^2$
 - (2) $400\pi \text{ mm/s}^2$
 - (3) $700\pi \text{ mm/s}^2$
 - (4) $300\pi \text{ mm/s}^2$
- Modulus of Rigidity is related to -
 - (1) Length
 - (2) Shape
 - (3) Size
 - (4) Volume
- The stress – strain curve of an ideal elastic material with strain hardening will be as -
 - (1) 
 - (2) 
 - (3) 
 - (4) 

8. What is the mode of failure of a short mild steel column (having slenderness ratio less than 10) under axial compressive load?
- (1) Fracture (2) Buckling
(3) Yielding (4) Both (2) and (3)
9. A solid circular shaft is subjected to pure torsion. The ratio of maximum shear to maximum normal stress at any point would be -
- (1) 1 : 1 (2) 1 : 2
(3) 2 : 1 (4) 2 : 3
10. Material used for machine tool beds is -
- (1) cast iron (2) mild steel
(3) high carbon steel (4) alloy steel
11. The crystal structure of austenite is -
- (1) body centered cubic (2) face centered cubic
(3) hexagonal closed packed (4) body centered tetragonal
12. In a 3 – D state of stress, the independent stress components required to define state – of – stress at a point are -
- (1) 3 (2) 6
(3) 12 (4) 9
13. Detrimental property of a material for shock load applications is-
- (1) High density (2) Low toughness
(3) High strength (4) Low hardness
14. What causes transformation of deformed martensite into austenite phase?
- (1) Heating (2) Cooling
(3) Both (1) and (2) (4) Quenching
15. Brass is an alloy of -
- (1) copper and zinc (2) tin and zinc
(3) copper and tin (4) copper and aluminium
16. Cutting tool material 18 – 4 – 1 HSS has which one of the following compositions?
- (1) 18% W, 4% Cr, 1% V (2) 18% Cr, 4% W, 1% V
(3) 18% W, 4% Ni, 1% V (4) 18% Cr, 4% Ni, 1% V

17. A built – up – edge is formed while machining -
- (1) Ductile materials at high speed (2) Ductile materials at low speed
(3) Brittle materials at high speed (4) Brittle materials at low speed
18. Why does crater wear start at some distance from the tool tip?
- (1) Tool strength is minimum at that region (2) Cutting fluid cannot penetrate that region
(3) Tool temperature is maximum in that region (4) Stress on rake face is maximum at that region
19. The process of removing the burrs or flash from a forged component in drop forging is called -
- (1) Swaging (2) Perforating
(3) Trimming (4) Fettling
20. Which one of the following methods is used for the manufacturing of collapsible tooth – paste tubes?
- (1) Impact extrusion (2) Direct extrusion
(3) Deep drawing (4) Piercing
21. The maximum efficiency of a screw jack is.....
- (1) $\frac{1 - \sin\phi}{1 + \sin\phi}$ (2) $\frac{1 + \sin\phi}{1 - \sin\phi}$
(3) $\frac{1 - \tan\phi}{1 + \tan\phi}$ (4) $\frac{1 + \tan\phi}{1 - \tan\phi}$
22. A four – link mechanism shown in the figure has link lengths as AB = 50 mm, BC = 66 mm, CD = 56 mm and AD = 100 mm. If at an instant when $\angle DAB = 60^\circ$ and the link AB has an angular velocity of 10.5 rad/s in the counter – clockwise direction, the velocity of B relative to A (vector v_{ba}) (in m/s) of the point C is.....



- (1) 0.131 (2) 0.262
(3) 0.393 (4) 0.525

23. In a gear train in which the axes of the shafts over which the gears are mounted, move relative to a fixed axis, is called.....
- (1) Compound gear train (2) Simple gear train
 (3) Epicyclic gear train (4) Reverted gear train
24. If E is the Young's modulus, K is the bulk modulus and C is the modulus of rigidity, the relation between them is.....
- (1) $E = \frac{3K}{9K + C}$ (2) $E = \frac{9KC}{3K + C}$
 (3) $E = \frac{3K + C}{9KC}$ (4) $E = \frac{3K}{9K + C}$
25. The word kanban is most appropriately associated with -
- (1) Economic order quantity (2) Just – in – time production
 (3) Capacity planning (4) Product design
26. As production systems move from projects to batch production to mass production to continuous production -
- (1) demand volume increases (2) products become more customized
 (3) production systems become less automated (4) production systems become more flexible
27. For activities on the critical path -
- (1) earliest start time (ES) = latest start time (LS) (2) earliest start time (ES) > latest start time (LS)
 (3) earliest start time (ES) < latest start time (LS) (4) earliest start time (ES) = latest finish time (LF)
28. Which of the following is not a type of predictable demand behavior?
- (1) trend (2) random variation
 (3) cycle (4) seasonal pattern
29. The ratio of transverse contraction strain to longitudinal extension strain in the direction of stretching force within elastic limits and for a homogeneous material is.....
- (1) Modulus of Elasticity (2) Modulus of Rigidity
 (3) Bulk Modulus (4) Poisson Ratio

30. The smallest portion of a crystal which when repeated in different directions generates the entire crystal is.....
- (1) crystal lattice (2) unit cell
(3) lattice point (4) gage length
31. Permanent deformation of solid material under the influence of long – term exposure of high level of mechanical stresses that are still below the yield strength along with subjected to heat is.....
- (1) Elasticity (2) Isotropy
(3) Hardness (4) Creep
32. The atomic packing factor for face – centered cubic structure is.....
- (1) 0.34 (2) 0.52
(3) 0.68 (4) 0.74
33. The statement that molecular weights of all gases occupy the same volume is known as -
- (1) Avogadro’s hypothesis (2) Gas law
(3) Dalton’s law (4) Thermodynamics law
34. It is desired to store 28 kg of nitrogen at 14 MPa pressure and 27°C in a cylinder. Assuming that nitrogen behaves like an ideal gas, determine the size of the cylinder.
- (1) 0.01782 m³ (2) 0.1782 m³
(3) 1.782 m³ (4) 17.82 m³
35. The first law of thermodynamics was developed by -
- (1) Joule (2) Kelvin
(3) Charles (4) Carnot
36. Which one of the following non – dimensional numbers is used for transition from laminar to turbulent flow in free convection?
- (1) Reynolds number (2) Nusselt number
(3) Peclet number (4) Rayleigh number
37. Which one of the following is correct? The effectiveness of a fin will be maximum in an environment with-
- (1) Free convection (2) Forced convection
(3) Radiation (4) Convection and radiation

38. Which one of the following expansion processes takes place in a vapour compression cycle?
- (1) Polytropic process with change in temperature
 (2) Adiabatic process with work transfer
 (3) Isentropic process with change in enthalpy
 (4) Adiabatic process with constant enthalpy
39. A good refrigerant should have -
- (1) Large latent heat of vaporization and low operating pressures
 (2) Small latent heat of vaporization and high operating pressures
 (3) Large latent heat of vaporization and high operating pressures
 (4) Small latent heat of vaporization and low operating pressures
40. If a mass of moist air in an airtight vessel is heated to a higher temperature, then -
- (1) Specific humidity of the air increases
 (2) Specific humidity of the air decreases
 (3) Relative humidity of the air increases
 (4) Relative humidity of the air decreases
41. A Pelton wheel is ideally suited for -
- (1) High head and low discharge
 (2) High head and high discharge
 (3) Low head and low discharge
 (4) Medium head and medium discharge
42. The ability of casting material to fill the mould cavity is described by.....
- (1) cohesiveness
 (2) reactivity
 (3) fluidity
 (4) permeability
43. The primary cause for deflection of arc during arc welding is.....
- (1) hydrostatic field
 (2) magnetic field
 (3) explosive field
 (4) wind velocity field
44. Another name for Military organization is.....
- (1) Line organization
 (2) Functional organization
 (3) Line and staff organization
 (4) Hybrid organization
45. A worker takes an average of 10 minutes to complete a task. If the performance rating is 110% and an allowance of 15% is permissible, the standard time (in minutes) for completing the task is.....
- (1) 9
 (2) 10
 (3) 11
 (4) 12.9

46. The property of a working substance which increases or decreases as the heat is supplied or removed in a reversible manner is.....
- (1) entropy (2) external energy
(3) internal energy (4) enthalpy
47. A composite wall has two layers of different materials having thermal conductivities of k_1 and k_2 . If each layer has the same thickness, the equivalent thermal conductivity of the wall is.....
- (1) $k_1 + k_2$ (2) $\frac{(k_1 + k_2)}{k_1 k_2}$
(3) $\frac{(2k_1 k_2)}{k_1 + k_2}$ (4) $k_1 k_2$
48. When a hot fluid is flowing over a cold flat plate, the temperature gradient is.....
- (1) zero at the surface (2) negative at the surface
(3) zero at the edge of the thermal boundary layer (4) positive at the edge of the thermal boundary layer
49. The critical radius is the insulation radius at which the resistance to heat flow is.....
- (1) Minimum (2) Zero
(3) Maximum (4) Double
50. Amongst the following options what remains constant during adiabatic saturation process on unsaturated air?
- (1) Dew point temperature (2) Relative humidity
(3) Wet bulb temperature (4) Dry bulb temperature
51. The formation of frost on cooling coils in a refrigerator.....
- (1) improves C. O. P. of the system (2) increases power consumption
(3) increases heat transfer (4) reduces power consumption
52. If a gas is to be liquefied, its temperature must be.....
- (1) increased to two times of critical temperature (2) increased to five times of the critical temperature
(3) raised to ten times of the critical temperature (4) decreased below the critical temperature

53. Dew point temperature is the temperature at which condensation begins when the air is cooled at constant -
- (1) Volume (2) Pressure
(3) Entropy (4) Enthalpy
54. If w = Specific weight of water in N/m^3 , a = Cross sectional area of jet in m^2 and V = Velocity of jet in m/s , the force exerted (in N) by a jet of water impinging normally on a fixed plate is.....
- (1) $waV/2g$ (2) waV/g
(3) $waV^2/2g$ (4) waV^2/g
55. If V_1 is inlet jet velocity, u is blade velocity and ϕ = outlet blade angle (bucket angle), the hydraulic efficiency of a Pelton wheel is expressed as.....
- (1) $\eta_h = \frac{(2u)(V_1-u)(1+\cos\phi)}{V_1^2}$ (2) $\eta_h = \frac{(2u)(V_1+u)(1+\cos\phi)}{V_1^2}$
(3) $\eta_h = \frac{(2u)(V_1+u)(1-\cos\phi)}{V_1^2}$ (4) $\eta_h = \frac{(2u)(V_1-u)(1-\cos\phi)}{V_1^2}$
56. Convergent – divergent nozzle is said to be choked when.....
- (1) critical pressure is attained at the exit and (2) velocity at the throat becomes Mach number at this section is sonic
(3) exit velocity becomes supersonic (4) mass flow rate through the nozzle reaches a maximum value
57. A steam turbine, in which a part of the steam after partial expansion, is used for process heating and the remaining steam is further expanded for power generation, is known as.....
- (1) Back pressure turbine (2) Impulse turbine
(3) Low pressure turbine (4) Pass out turbine
58. Compression ratio of I. C. engine is.....
- (1) the ratio of the volume of its combustion chamber from its largest capacity to its smallest capacity. (2) the ratio of clearance volumes available in the combustion cylinder.
(3) the ratio of pressure after compression to pressure before compression. (4) the ratio of pressure before compression to pressure after compression.

59. Vapor lock in a gasoline – fueled internal combustion engine is basically.....
- (1) due to partial stoppage of fuel supply due to vaporization of fuel in the supply
 (2) due to mechanical seizure in the exhaust system
 (3) due to accelerated supply of fuel to the engine
 (4) due to freezing of liquid fuel
60. The ignition quality of petrol is expressed by -
- (1) Octane number
 (2) Cetane number
 (3) Calorific value
 (4) Efficiency number
61. Which of the following is an inversion of single slider – crank chain?
- (1) Elliptical Trammel
 (2) Hand Pump
 (3) Scotch Yoke
 (4) Oldham's Coupling
62. The Velocity ratio in the case of compound train of wheels is equal to -
- (1) $\frac{\text{Number of teeth on first driver}}{\text{Number of teeth on last follower}}$
 (2) $\frac{\text{Number of teeth on last follower}}{\text{Number of teeth on first driver}}$
 (3) $\frac{\text{Product of teeth on the drivers}}{\text{product of teeth on the followers}}$
 (4) $\frac{\text{Product of teeth on the followers}}{\text{product of teeth on the drivers}}$
63. A body of weight 50 N is kept on a plane inclined at an angle of 30° to the horizontal. It is in limiting equilibrium. The coefficient of friction is equal to -
- (1) $\frac{1}{\sqrt{3}}$
 (2) $\sqrt{3}$
 (3) $\frac{1}{50\sqrt{3}}$
 (4) $\frac{\sqrt{3}}{5}$
64. Find the extension of a bar of length 'L' and weight 'w/unit length' having uniform cross section area 'A' suspended from top, due to its self-weight and a load 'P' applied at bottom (along the direction of self-weight). What is the extension if P = weight of the bar?
- (1) $\frac{P L}{A E}$
 (2) $\frac{w L^2}{2 E}$
 (3) $\frac{3 w L^2}{2 E}$
 (4) $2 \left[\frac{P L}{A E} + \frac{w L^2}{2 E} \right]$
65. The value of J in equation $\frac{T}{J} = \frac{S}{y} = \frac{G \theta}{l}$ for a circular solid shaft of diameter 'D' will be -
- (1) $\frac{\pi D^4}{32}$
 (2) $\frac{\pi D^4}{64}$
 (3) $\frac{\pi D^3}{64}$
 (4) $\frac{\pi D^3}{32}$

66. While designing a shaft, pulley and key for a system -
- (1) Shaft is the weakest member (2) Pulley is the weakest member
(3) Key is the weakest member (4) All are designed for equal strength
67. Eutectic reaction for iron – carbon system occurs at -
- (1) 600 °C (2) 723 °C
(3) 1147 °C (4) 1490 °C
68. The percentage of carbon in gray cast iron is in the range of -
- (1) 0.25 to 0.75% (2) 1.25 to 1.75%
(3) 3 to 4% (4) 8 to 10%
69. The vibration frequency used for the tool in the Ultrasonic machining is of the order of -
- (1) 10,000 oscillations per second (2) 20,000 oscillations per second
(3) 35,000 oscillations per second (4) 45,000 oscillations per second
70. Which one of the following materials will require the largest size of riser for the same size of casting?
- (1) Aluminium (2) Cast iron
(3) Steel (4) Copper
71. The proportion of acetylene and oxygen used in gas welding is -
- (1) 2 : 1 (2) 1 : 1
(3) 1 : 2 (4) 3 : 4
72. An isolated system -
- (1) is a specified region where transfer of energy and/or mass takes place. (2) is a region of constant mass and only energy is allowed to cross the boundaries.
(3) cannot transfer either energy or mass to or from the surroundings. (4) is one in which mass within the system is not necessarily constant.
73. In the polytropic process equation $p v^n = \text{constant}$ if η is infinitely large, the process is termed as -
- (1) Constant volume (2) Constant pressure
(3) Constant temperature (4) Adiabatic

74. For same compression ratio -
- (1) Thermal efficiency of Otto cycle is greater than that of Diesel cycle. (2) Thermal efficiency of Otto cycle is less than that of Diesel cycle.
- (3) Thermal efficiency of Otto cycle is same as that of Diesel cycle. (4) Mechanical efficiency of Otto cycle is greater than that of Otto cycle.
75. If the temperature of the source is increased, the efficiency of the Carnot engine -
- (1) decreases (2) increases
- (3) will be equal to the efficiency of a practical engine (4) does not change
76. In a reversible adiabatic process the ratio (T_1 / T_2) is equal to -
- (1) $\left(\frac{p_1}{p_2}\right)^{\frac{\gamma-1}{\gamma}}$ (2) $\left(\frac{v_1}{v_2}\right)^{\frac{\gamma-1}{\gamma}}$
- (3) $(v_1 v_2)^{\frac{\gamma-1}{2\gamma}}$ (4) $\left(\frac{v_2}{v_1}\right)^{\gamma}$
77. A stocking finds that monthly demand for a particular ball pen is 2000. The price of each pen is 0.8 rupees and cost of placing an order is ₹ 20. The cost of stocking the pens per month is 10% of price of pen. What is EOQ?
- (1) 1000 (2) 2000
- (3) 500 (4) 750
78. A PERT activity has an optimistic time of three days, pessimistic time of 15 days and the expected time is 7 days. The most likely time of the activity is -
- (1) 5 days (2) 6 days
- (3) 7 days (4) 9 days
79. In a weaving operation, the parameter to be controlled is the number of defects per 10 square yards of material. Control chart appropriate for this task is -
- (1) P – chart (2) C – chart
- (3) R – chart (4) \bar{X} – chart
80. Preliminary work sampling studies show that machine was idle 25% of the time based on a sample of 100 observations. The number of observations needed for a confidence level of 95% ($k = 2$) and an accuracy of $\pm 5\%$ is -
- (1) 400 (2) 1200
- (3) 3600 (4) 4800

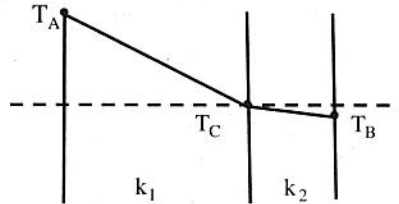
81. The equation of effectiveness $\varepsilon = 1 - e^{-NTU}$ of heat exchanger is valid (NTU is number of transfer units) in the case of -

- (1) boiler and condenser for parallel flow (2) boiler and condenser for counter flow
 (3) boiler and condenser for both parallel and counter flow (4) gas turbine for both parallel and counter flow

82. The radial heat transfer rate through hollow cylinder increases as the ratio of outer radius to inner radius -

- (1) decreases (2) increases
 (3) constant (4) decreases as well as increases

83. The temperature variation under steady heat conduction across a composite slab of two materials of conductivities k_1 and k_2 is shown in Fig. Then which one of the following statements holds?



- (1) $k_1 > k_2$ (2) $k_1 = k_2$
 (3) $k_1 = 0$ (4) $k_1 < k_2$

84. The radiation heat transfer from an inner cylindrical surface of radius r_1 and emissivity ε_1 at temperature T_1 to concentric cylinder of radius r_2 , emissivity ε_2 and at temperature T_2 is proportional to -

- (1) $\frac{T_1^4 - T_2^4}{\left[\frac{1}{\varepsilon_1} + \left(\frac{1}{\varepsilon_2} - 1 \right) \left(\frac{r_1}{r_2} \right) \right]}$ (2) $\frac{T_1^4 - T_2^4}{\left[\frac{1}{\varepsilon_1} - \left(\frac{1}{\varepsilon_2} - 1 \right) \left(\frac{r_1}{r_2} \right) \right]}$
 (3) $\frac{T_1^4 - T_2^4}{\left[\frac{1}{\varepsilon_1} + \left(\frac{1}{\varepsilon_2} - 1 \right) \left(\frac{r_2}{r_1} \right) \right]}$ (4) $\frac{\left(\frac{r_2}{r_1} \right) (T_1^4 - T_2^4)}{\frac{1}{\varepsilon_1} + \left(\frac{1}{\varepsilon_2} - 1 \right)}$

85. In radiative heat transfer a gray surface is one -
- (1) which appears gray to the eye. (2) whose emissivity is independent of wavelength.
- (3) which has reflectivity equal to zero. (4) which appears equally bright from all directions.
86. Non-dimensional form of natural convection heat transfer coefficient is -
- (1) Grashof number (2) Reynolds number
- (3) Nusselt number (4) Prandtl number
87. A centrifugal pump lifts water through a height h and delivers it at a velocity v_d . The loss of head through piping is h_f . The gross lift is -
- (1) $h + h_f$ (2) $h_f + \frac{v_d^2}{2g}$
- (3) $h + h_f + \frac{v_d^2}{2g}$ (4) $h + \frac{v_d^2}{2g}$
88. Which one of the following sets of condition clearly apply to an ideal fluid?
- (1) Viscous and compressible (2) Non Viscous and incompressible
- (3) Non Viscous and compressible (4) Viscous and incompressible
89. If the velocity vector in a two dimensional flow field is given by $\vec{v} = 2xy\hat{i} + (2y^2 - x^2)\hat{j}$; then the vorticity vector $\text{curl } \vec{v}$ will be -
- (1) $2y^2\hat{j}$ (2) $6y\hat{k}$
- (3) Zero (4) $-4x\hat{k}$
90. The Reynolds number for flow of a certain fluid in a circular tube is specified as 2500. What will be the Reynolds number when the tube diameter is increased by 20% and the fluid velocity is decreased by 40% keeping fluid the same?
- (1) 1200 (2) 1800
- (3) 3600 (4) 200
91. If there are 'm' physical quantities and 'n' fundamental dimensions in a particular process, the number of non-dimensional parameters is -
- (1) $m + n$ (2) $m \times n$
- (3) $m - n$ (4) m / n

92. If x is the distance measured from the leading edge of a flat plate, then laminar boundary layer thickness varies as -
- (1) $\frac{1}{x}$ (2) $\frac{4}{x^5}$
 (3) x^2 (4) $\frac{1}{x^2}$
93. In the unsaturated air the state of vapour is -
- (1) Wet (2) Superheated
 (3) Saturated (4) Unsaturated
94. During sensible heating of moist air, enthalpy -
- (1) increases (2) decreases
 (3) remains constant (4) none of the above
95. The relative humidity, during cooling and dehumidification of moist air -
- (1) increases (2) decreases
 (3) can increase or decrease (4) remains constant
96. A heat pump operating between high temperature T_1 and low temperature T_2 has its COP expressed as -
- (1) $\frac{T_1}{T_1 - T_2}$ (2) $\frac{T_2}{T_1 - T_2}$
 (3) $\frac{T_1 - T_2}{T_1 + T_2}$ (4) $\frac{T_1 + T_2}{T_1 - T_2}$
97. Voltage developed to strike spark in the spark plug is in the range of -
- (1) 6 to 12 Volts (2) 1000 to 2000 Volts
 (3) 20000 to 25000 Volts (4) None of the above
98. Which among the following is the boiler mounting?
- (1) Blow off cock (2) Feed pump
 (3) Economizer (4) Superheater
99. A curve showing the variation of load on a power station with respect to time is known as-
- (1) Load curve (2) Load duration curve
 (3) Diversity factor (4) Performance curve
100. A power generation station is to supply four regions of loads with peak demands of 10 MW, 15 MW, 20 MW and 30 MW. If the diversity factor is 1.5, the maximum demand on the station is-
- (1) 70 MW (2) 60 MW
 (3) 50 MW (4) 40 MW

Space for Rough Work

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