

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

2022
Test Booklet

SAMK

Time allowed : 2 hours
Full marks : 200
Questions are of equal Mark

**BOOKLET
GROUP**

D

Roll No.

Full Signature of the Candidate :

INSTRUCTIONS

Candidates should read the following instructions carefully before answering the questions :

1. This booklet consists of 16 pages including this front page. Verify the page Nos. and Group on each page and bring at once to the Invigilator's notice, discrepancy, if any.
2. Answer will have to be given in the Answer-Sheet supplied for the purpose.
3. You should write your Roll No. & Full Signature on this page (where directed) and Full name, Roll No., Centre of Examination, Booklet Group & Full Signature with date (where indicated) on the Answer-Sheet in BLACK Ball Point Pen.
4. All questions are of multiple-choice answer type. You will find your probable answers (A), (B), (C) & (D) against each question. Find out which of the four answers appears to you to be correct. NOW DARKEN COMPLETELY WITH BLACK BALL POINT PEN WITHIN THE CIRCLE BELOW THE LETTER OF THE SELECTED ANSWER IN THE ANSWER-SHEET AS SHOWN HEREUNDER :

Example— Question : Kolkata is the capital city of—

(A) Bihar

(B) Assam

(C) Orissa

(D) West Bengal

Answer :

(A)

(B)

(C)

(D)

5. i) If more than one circle is darkened for a particular answer it will be treated as an incorrect/wrong answer.
ii) Any sign other than complete darken inside the circle will be treated as incorrect/wrong answer.
6. There are 100 questions carrying 2 (TWO) marks each.
7. THERE WILL BE NEGATIVE MARKING. 1 (ONE) MARK WILL BE DEDUCTED FOR EACH WRONG / INCORRECT ANSWER.
8. There is/are extra blank page/s at the end of this booklet for rough work. The sheet should not be torn out from the Test Booklet.
9. Candidates are not allowed to use Calculator, Pager and Mobile Phone or any other type of electronic gadget of communication in the Examination Hall.
10. The Entire Set (Answer-Sheet & Test Booklet including used/unused extra pages) should be handed over to the Invigilator before leaving the Examination Hall.
11. You are warned against adoption of any unfair means at the examination. Any report in this behalf from Centre Supervisors or Examiners may lead to instant cancellation of your examination and debarment from appearing in future examinations/selections.

(Contd. to page - 2)

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1. **In a beam of uniform strength, every section has same value of:**
 - (A) Bending moment
 - (B) Bending stress
 - (C) Strain
 - (D) Moment of inertia

2. **One ton refrigeration machine implies that the machine:**
 - (A) Has a gross weight 1 ton
 - (B) Consumes one ton of refrigerant in 24 hours
 - (C) Has the capacity to convert one ton of water into ice
 - (D) Is capable of extracting heat that would melt one ton of ice at 0°C into water at 0°C in a period of 24 hours

3. **A cantilever beam of length L, moment of inertia I, Young's modulus E carries a concentrated load W at the middle of its length. The slope of the cantilever at the free end is:**
 - (A) $(WL^2)/(2EI)$
 - (B) $(WL^2)/(4EI)$
 - (C) $(WL^2)/(8EI)$
 - (D) $(WL^2)/(16EI)$

4. **The branch of science that deals with interactions of man with the machine is called as –**
 - (A) Aesthetics
 - (B) Ergonomics
 - (C) Economics
 - (D) Statistics

5. **Thermal conductivity is defined as the heat flow per unit time:**
 - (A) When temperature gradient is unity
 - (B) When a unit temperature difference is maintained across the opposite faces of the wall
 - (C) Through a unit thickness of the wall
 - (D) Across unit area when temperature gradient is unity

6. **Steel can be hardened quickly by the process of:**
 - (A) Induction hardening
 - (B) Nitriding
 - (C) Cyaniding
 - (D) Carburising

7. **During normalizing operation, the steel castings are cooled in:**
 - (A) Air
 - (B) An oil bath
 - (C) Water
 - (D) The furnace itself

8. **A Zener diode is used as –**
 - (A) An amplifier
 - (B) A voltage regulator
 - (C) A rectifier
 - (D) A multivibrator

9. **The product EI known as:**
 - (A) Section modulus
 - (B) Modulus of rupture
 - (C) Flexural rigidity
 - (D) Polar modulus

10. A refrigerator working on a reversed Carnot cycle has a COP of 5. If it is made to work as a refrigerator taking 1 kW, the heating effect will be:
- (A) 1 kW
 - (B) 4 kW
 - (C) 5 kW
 - (D) 6 kW
11. To show the cross section of spokes (or limbs or arms) of a flywheel or pulley on the spoke (limb/arm) itself, we can use –
- (A) Full section
 - (B) Quarter section
 - (C) Half section
 - (D) Revolved/rotated section
12. If the speed of the engine varies between 390 and 410 rpm in a cycle of operation, the coefficient of fluctuation of speed will be:
- (A) 0.01
 - (B) 0.02
 - (C) 0.04
 - (D) 0.05
13. The viscosity of a fluid in motion is 1 Poise. Then the viscosity (in Poise) when the fluid is at rest will be:
- (A) 0
 - (B) 0.5
 - (C) 1
 - (D) 2
14. If a rotating system is dynamically balanced, it is statically –
- (A) Balanced
 - (B) Unbalanced
 - (C) Partially balanced
 - (D) Unaffected
15. The stress level below which a specimen can withstand cyclic stress indefinitely without exhibiting fatigue failure is called –
- (A) Elastic limit
 - (B) Proportional limit
 - (C) Endurance limit
 - (D) Tolerance limit
16. Shafts having their axes parallel but not in alignment are coupled together using –
- (A) Flanged coupling
 - (B) Muff coupling
 - (C) Universal coupling
 - (D) Oldham coupling
17. A PN junction acts as a –
- (A) Controlled switch
 - (B) Bidirectional switch
 - (C) Unidirectional switch
 - (D) None of the above
18. Short circuit test of a transformer helps to find –
- (A) Copper loss at no load
 - (B) Iron loss at no load
 - (C) Copper loss at any desired load
 - (D) Iron loss at full load

19. The shape of the bending moment diagram for a cantilever beam carrying a uniformly distributed Load is:
- (A) A straight line
 - (B) A hyperbola
 - (C) An ellipse
 - (D) A parabola
20. At critical pressure:
- (A) Entropy is zero
 - (B) Latent heat of vaporization is zero
 - (C) Saturated vapour becomes a gas
 - (D) Sublimation occurs from solid to vapour phase
21. A steel rod of length ℓ and diameter d , fixed at both ends is uniformly heated to a temperature rise of ΔT . The Young's modulus is E and the coefficient of linear expansion is α . The thermal stress in the rod is:
- (A) Zero
 - (B) $\alpha (\Delta T)$
 - (C) $E \alpha (\Delta T)$
 - (D) $E \alpha (\Delta \ell)$
22. A cantilever beam is subjected to a bending moment of 24000 Nm. If the allowable bending stress is stated to be 140 MPa, the section modulus would be nearest to:
- (A) 175 cm^3
 - (B) 200 cm^3
 - (C) 185 cm^3
 - (D) 160 cm^3
23. The chisels and files used in a fitting shop are generally made of:
- (A) Cast iron
 - (B) High carbon steel
 - (C) Mild steel
 - (D) Forged steel
24. Heating elements and electrical resistance wires are generally made of:
- (A) Nichrome
 - (B) Invar
 - (C) Perm invar
 - (D) White metal
25. Fusible plug for a steam boiler consists of:
- (A) Bismuth, lead and tin
 - (B) Bismuth, zinc and tin
 - (C) Zinc, copper and lead
 - (D) Copper, lead and aluminium
26. Mollier diagram is a plot of:
- (A) Temperature and entropy
 - (B) Temperature and enthalpy
 - (C) Pressure and enthalpy
 - (D) Enthalpy and entropy
27. High speed gears are made from plastics of the type:
- (A) Fibre glass
 - (B) Capron
 - (C) Foliate
 - (D) Polythene

28. A block resting on an inclined plane begins to slide down the plane when the angle of inclination is gradually increased to 30° . Then the coefficient of friction between the block and the plane is:
- (A) 0.50
(B) 0.578
(C) 0.72
(D) 0.866
29. For a heat engine operating on Carnot cycle, the work output is $1/4^{\text{th}}$ of the heat rejected to the sink. The thermal efficiency of the engine would be:
- (A) 10%
(B) 20%
(C) 30%
(D) 50%
30. Select the proper sequence:
(A) Proportional limit, (B) Elastic limit, (C) Yielding, (D) Failure
- (A) B, C, A, D
(B) B, A, C, D
(C) A, C, B, D
(D) A, B, C, D
31. The phenomenon of progressing extension of the material, i.e., strain increasing with time at a constant load is termed as:
- (A) Yielding
(B) Creeping
(C) Strain hardening
(D) Enduring
32. The Stefan-Boltzman constant has units of:
- (A) $\text{kcal/m}^2\text{-hr-K}^4$
(B) kcal/m-hr-K^4
(C) kcal/hr-K^4
(D) $\text{kcal/m}^2\text{-K}^4$
33. The strain energy stored in a body due to external loading, within the elastic limit, is known as:
- (A) Malleability
(B) Ductility
(C) Toughness
(D) Resilience
34. A water main of 1 m diameter contains water at a pressure head of 100 meters. The permissible Tensile stress in the material of main is 25 MPa. What is the minimum thickness of the water main?
(Take $g = 10 \text{ m/s}^2$)
- (A) 10 mm
(B) 20 mm
(C) 50 mm
(D) 60 mm
35. A simply supported beam of span l and carrying a load W concentrated at the mid span will have a maximum bending moment of:
- (A) $Wl/8$
(B) $Wl/4$
(C) $Wl/2$
(D) Wl

36. Use of pulverized coal in boiler furnace provides:
- (A) Smokeless burning
 - (B) Better combustion
 - (C) Less corrosion on furnace walls
 - (D) High calorific value
37. Absorptivity of a body is equal to its emissivity:
- (A) For a polished body
 - (B) Under thermal equilibrium condition
 - (C) At one particular temperature
 - (D) At shorter wavelengths
38. The ratio E/K between modulus of elasticity and bulk modulus for a material with Poisson's ratio μ is:
- (A) $2(1-\mu)$
 - (B) $(3-2\mu)$
 - (C) $3(1+\mu)$
 - (D) $3(1-2\mu)$
39. The working principle of thermocouple is based on –
- (A) Compton effect
 - (B) Photo electric effect
 - (C) Meissner effect
 - (D) Seebeck effect
40. In high speed steels, the alloying element with maximum percentage is:
- (A) Vanadium
 - (B) Nickel
 - (C) Tungsten
 - (D) Silicon
41. As per IS:1570, C 45 (or 45C8) steel will have a carbon percentage of –
- (A) 0.1 – 0.2%
 - (B) 0.4 – 0.5%
 - (C) 0.7 – 0.8%
 - (D) 0.6 – 0.9%
42. In pneumatic circuits, the full form of FRL –
- (A) Fully Regulated Lubrication
 - (B) Filler Regulator Lubricator
 - (C) Fitted Regulatory Lubrication
 - (D) Filter Regulator Lubricator
43. Hydraulic fuses protect the circuit from pressure overload by –
- (A) Switching of the pump
 - (B) Rupturing the metallic disc and leaking the oil
 - (C) Vaporizing the excess oil
 - (D) Blocking the flow of oil through it fully
44. An ammeter is convertible to a voltmeter by –
- (A) Changing the scale
 - (B) Putting a large resistance in parallel with actual measuring part of the instrument
 - (C) Putting a large resistance in series with actual measuring part of the instrument
 - (D) Simply installing the instrument in parallel with the circuit

45. The composition of soft solder is—
(A) Lead 58% and tin 42%
(B) Lead 50% and tin 50%
(C) Lead 37% and tin 63%
(D) Lead 70% and tin 30%
46. In rolling operation, the difference between initial metal thickness and final metal thickness is called—
(A) Camber
(B) Clearance
(C) Draft
(D) Allowance
47. The operation of removing the burr or flash from the forged parts in drop forging is known as—
(A) Trimming
(B) Trepanning
(C) Fettling
(D) Grinding
48. According to Kennedy's theorem, the instantaneous centers of three body having relative motion lie on a—
(A) Curve path
(B) Straight line
(C) Point
(D) Circle
49. The commonly used flux in brazing are—
(A) Boron carbide
(B) Ammonium boro-silicate
(C) Sodium chloride
(D) Sodium tetraborate decahydrate
50. For a speed ratio of 100, smallest gear box can be obtained by using:
(A) A pair of spur gears
(B) A pair of bevel and a pair of spur gears in compound gear train
(C) A pair of helical and a pair of spur gears in a compound gear train
(D) A pair of helical and a pair of worm gears in compound gear train
51. The best cam profile which eliminates the shock and vibration at the beginning of stroke is:
(A) Double harmonic
(B) Circular arc
(C) Cyclical
(D) Straight line
52. The iron ore mostly used for the production of pig iron is:
(A) Hematite
(B) Siderite
(C) Limonite
(D) Magnetite
53. Negative slip occurs in reciprocating pumps, when delivery pipe is:
(A) Long and suction pipe is short and pump is running at slow speed
(B) Long and suction pipe is short and pump is running at high speed
(C) Short and suction pipe is long and pump is running at slow speed
(D) Short and suction pipe is long and pump is running at high speed

54. The clapper block is used in—
 (A) Milling machine
 (B) Lathe machine
 (C) Drilling machine
 (D) Shaping machine
55. At break-even point, profit is —
 (A) Maximum
 (B) Zero
 (C) Minimum
 (D) Negative
56. Medium grain size or grit of grinding wheel is denoted by the numbers ranging from
 (A) 220-600
 (B) 80-180
 (C) 30-60
 (D) 10-24
57. 'If a defective part or equipment malfunction is discovered, the machine automatically stops and operators stop work and correct the problem rather than continuing production' – it is the principle of:
 (A) TPM
 (B) 5S
 (C) Kaizen
 (D) Jidoka
58. In CNC machines, G41-Code stands for—
 (A) Cutter compensation-left
 (B) Cutter compensation-right
 (C) Cutter compensation-cancel
 (D) Cutter compensation-double
59. The ratio of tight and slack side tensions in a V-belt or rope is—
 (A) $e^{\mu\theta \sin \alpha}$
 (B) $e^{\mu\theta/\cos \alpha}$
 (C) $e^{\mu\theta \cos \alpha}$
 (D) $e^{\mu\theta/\sin \alpha}$
60. Due to slip, the velocity ratio of a belt drive—
 (A) Increases
 (B) Decreases
 (C) Remain same
 (D) None of these
61. For maximum power transmission, the velocity of the belt is—
 (A) $\sqrt{\frac{T}{m}}$
 (B) $\sqrt{\frac{T}{2m}}$
 (C) $\sqrt{\frac{T}{3m}}$
 (D) $\sqrt{\frac{T}{4m}}$
62. A Hartnell governor is a —
 (A) Pendulum type governor
 (B) Inertia governor
 (C) Spring loaded governor
 (D) Dead weight governor
63. In a self-locking brake, the force required to apply the brake is —
 (A) Maximum
 (B) Minimum
 (C) Zero
 (D) All of the above

64. **Wood is:**
- (A) Homogenous material
 - (B) Granular material
 - (C) Amorphous material
 - (D) Cellular material
65. **Stress concentration in a machine component results from:**
- (A) Abrupt changes in the cross-section of the component
 - (B) Pressure at points/areas of the component at which the load is applied
 - (C) Point-to-point variation in the properties of the material of the component.
- Among the above, the correct statements are:
- (A) A and B
 - (B) A and C
 - (C) B and C
 - (D) A, B and C
66. **Boring is a method of-**
- (A) Generating a hole
 - (B) Enlarging a hole
 - (C) Finishing a hole
 - (D) Drilling a hole
67. **In a milling machine, the process of removing metal by a cutter which is rotated in the opposite direction of travel of the work piece, is called-**
- (A) Up milling
 - (B) Down milling
 - (C) Gang milling
 - (D) End milling
68. **ABC-analysis is based on -**
- (A) Parkinson principle
 - (B) Porter's principle
 - (C) Philip Kotler's principle
 - (D) Pareto principle
69. **Who is the founding father of scientific management theory?**
- (A) Frank Gilbreth, Sr.
 - (B) Max Weber
 - (C) Frederick Taylor
 - (D) Lillian Gilbreth
70. **In a sectional view, the hatch lines are shown in those regions in which -**
- (A) The cutting plane passes through the hollow portions
 - (B) There is no material present
 - (C) Some extra materials have to added
 - (D) The cutting plane passes through the solid portions of the object
71. **In CNC machines, M09-Code stands for-**
- (A) Coolant on
 - (B) Coolant off
 - (C) Flood coolant on
 - (D) Coolant heat up
72. **Spark gap in EDM process ranges between-**
- (A) 0.2 - 0.4 micron
 - (B) 0.4 - 0.8 micron
 - (C) 0.005 - 0.05 mm
 - (D) 0.05 - 0.5 mm

73. The polar section modulus of a solid circular shaft of diameter d about an axis through its centre of gravity is:
- (A) $\pi d^3/8$
 - (B) $\pi d^3/16$
 - (C) $\pi d^3/32$
 - (D) $\pi d^3/64$
74. The strain energy stored in a shaft due to torsion is given by:
- (A) $(\tau^2 V/2G)$
 - (B) $(\tau^2 V/4G)$
 - (C) $(\tau^2 V/8G)$
 - (D) $(\tau^2 V/16G)$
75. A capillary tube is used in a small refrigerator to serve the purpose of:
- (A) Expansion valve
 - (B) Thermostat
 - (C) Drier
 - (D) Evaporator
76. If a closed coil helical spring absorbs 30 N mm of energy while extending by 5 mm, its stiffness is:
- (A) 2 N/mm
 - (B) 4 N/mm
 - (C) 6 N/mm
 - (D) 10 N/mm
77. The refrigerant commonly used for commercial ice plants is:
- (A) Freon-12
 - (B) NH_3
 - (C) CO_2
 - (D) Air
78. LASER stands for-
- (A) Light Amplification by Simulated Erosion of Radiation
 - (B) Light Amplification by Stimulated Emission of Radiation
 - (C) Light Absorption by Stimulated Emission of Radiation
 - (D) Light Amplification by Stimulated Ejection of Radiation
79. FMS stands for-
- (A) Flexible Machining Solutions
 - (B) Flexible Manufacturing System
 - (C) Fundamental Manufacturing System
 - (D) Fundamental Machining Solutions
80. AGV stands for-
- (A) Autonomous Guided Vehicle
 - (B) Automated Guided Vehicle
 - (C) Autonomous Guided Variable
 - (D) Automated Guided Variable
81. Railway lines are welded by-
- (A) Gas welding
 - (B) Arc welding
 - (C) Resistance welding
 - (D) Thermit welding
82. The accuracy of micrometers, calipers and dial indicators can be check by-
- (A) Ring gauge
 - (B) Plug gauge
 - (C) Slip gauge
 - (D) Feeler gauge

83. A column with highest equivalent length has:
- (A) Both ends fixed
 - (B) Both ends hinged or pin-joined
 - (C) One end fixed, the other entirely free
 - (D) One end fixed, the other hinged
84. Amongst the following, a higher pair is:
- (A) A ball and socket joint
 - (B) toothed gearing
 - (C) Universal joint
 - (D) Cycle wheels turning on their axles
85. The angle of contact at the smallest pulley is taken into consideration while using the tension equation $T_1/T_2 = e^{\mu\theta}$ because:
- (A) The smaller pulley is weak as compared to the larger pulley
 - (B) The smaller pulley is always taken as the driving pulley
 - (C) The belt slipping occurs first on the smaller pulley
 - (D) The angle of lap on the smaller pulley is smaller than on the larger pulley
86. A toothed gearing with 30 teeth has a circular pitch of 15 mm. Then the diametral pitch will be closest to:
- (A) 0.21 mm
 - (B) 0.105 mm
 - (C) 0.7 mm
 - (D) 0.067 mm
87. Change in enthalpy in a closed system is equal to heat transferred, if the reversible process takes place at constant:
- (A) Temperature
 - (B) Internal energy
 - (C) Pressure
 - (D) Entropy
88. A body of weight of 10 N is suspended by a string 10 cm long and is held at a point 6 cm from the vertical line passing through the point of suspension by a horizontal force. The horizontal force is:
- (A) 7.5 N
 - (B) 10.2 N
 - (C) 16.7 N
 - (D) 13.6 N
89. The ratio of moment of inertia of a circular body about its x-axis to that about y-axis is:
- (A) 0.25
 - (B) 0.5
 - (C) 1.0
 - (D) 2.0
90. Air is being forced by the bicycle pump into a tyre against a pressure of 4.5 bar. A slow downward movement of the piston can be approximated as:
- (A) Isobaric
 - (B) Adiabatic process
 - (C) Isothermal process
 - (D) Throttling process

91. In a kinematic pair, when the elements have surface contact while in motion it is a—
(A) Lower pair
(B) Higher pair
(C) Closed pair
(D) Unclosed pair
92. The cam follower used in automobile engines is—
(A) Roller
(B) Flat faced
(C) Spherical faced
(D) Knife-edged
93. The point on the cam with the maximum pressure angle is known as the—
(A) Pitch curve
(B) Pitch point
(C) Trace point
(D) Prime point
94. The size of gears is usually specified by—
(A) Circular pitch
(B) Outside diameter
(C) Pitch circle diameter
(D) Inside diameter
95. The included angle of a pulley for V-belt is—
(A) $50^\circ - 60^\circ$
(B) $30^\circ - 40^\circ$
(C) $20^\circ - 30^\circ$
(D) $40^\circ - 50^\circ$
96. The lead screw of lathe along with half-nut is an example of—
(A) Rolling pair
(B) Screw pair
(C) Turning pair
(D) Sliding pair
97. The instantaneous center of a slider moving in a linear guide lies—
(A) At pin point
(B) At their point of contact
(C) At infinity
(D) At the center of curvature
98. Full form of LVDT is —
(A) Linear Variable Differential Transducer
(B) Linear Variable Differential Transformer
(C) Linear Voltage Differential Transducer
(D) Linear Voltage Differential Transformer
99. Which of the following is an inversion of single slider crank chain—
(A) Elliptical trammel
(B) Hand pump
(C) Scotch yoke
(D) Oldham's coupling
100. Master patterns generally have—
(A) Zero shrinkage allowance
(B) Double shrinkage allowance
(C) Triple shrinkage allowance
(D) Negative shrinkage allowance

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Question mark: 1 mark



Page No.

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