MSCWB SAE

Previous Year Paper
Mechanical 05 Jun, 2022

<u>Do not open this Booklet until you are asked to do so</u>

2022
Test Booklet
SAMK

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

BOOKLET GROUP

A

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.*

1. 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

2. 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 horizotal force. The horizontal force is:

   (A) 7.5 N
   (B) 10.2 N
   (C) 16.7 N
   (D) 13.6 N

3. 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

4. Air is being forced by the bycycle 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

5. 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

6. For a heat engine operating on Carnot cycle, the work output is $1/4^{th}$ of the heat rejected to the sink. The thermal efficienty of the engine would be:

   (A) 10%
   (B) 20%
   (C) 30%
   (D) 50%

7. 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

8. 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

9. Use of pulverized coal in boiler furnace provides:

   (A) Smokeless burning
   (B) Better combustion
   (C) Less corrosion on furnace walls
   (D) High calorific value

10. 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

11. 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) $3(1-2\mu)$

12. 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) $E \alpha (\Delta l)$

13. The Stefan-Boltzman constant has units of:

    (A) $kcal/m^2\text{-}hr\text{-}K^4$
    (B) $kcal/m\text{-}hr\text{-}K^4$
    (C) $kcal/hr\text{-}K^4$
    (D) $kcal/m^2\text{-}K^4$

14. 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

15. 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 m/s²)

    (A) 10 mm
    (B) 20 mm
    (C) 50 mm
    (D) 60 mm

16. 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

17. 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

18. 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

19. The product EI known as:

   (A) Section modulus
   (B) Modulus of rupture
   (C) Flexural rigidity
   (D) Polar modulus

20. 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

21. In a beam of uniform strength, every section has same value of:

   (A) Bending moment
   (B) Bending stress
   (C) Strain
   (D) Moment of inertia

22. 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

23. 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) $(WL^2)/(16EI)$

24. 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) $\pi d^3/64$

25. 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) $(\tau^2 V/16G)$

26. A capillary tube is used in a small refrigerator to serve the purpose of:

   (A) Expansion valve
   (B) Thermostat
   (C) Drier
   (D) Evaporator

27. 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

28. The refrigerant commonly used for commercial ice plants is:

   (A) Freon-12
   (B) NH_3
   (C) CO_2
   (D) Air

29. 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

30. 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

31. 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

32. A refrigerator working on a reversed Carnot cycle has a COP of 5. If it is made to work as a refriegerator taking 1 kW, the heating effect will be:

   (A) 1 kW
   (B) 4 kW
   (C) 5 kW
   (D) 6 kW

33. 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

34. 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

35. 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

36. 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

37. 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

38. The iron ore mostly used for the production of pig iron is:

   (A) Hematite
   (B) Siderite
   (C) Limonite
   (D) Magnetite

39. 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

40. **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 oppsite faces of the wall
    - (C) Through a unit thickness of the wall
    - (D) Across unit area when temperature gradient is unity

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

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

43. **In high speed steels, the alloying element with maximum percentage is:**
    - (A) Vanadium
    - (B) Nickel
    - (C) Tungsten
    - (D) Silicon

44. **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

45. **Heating elements and electrical resistance wires are generally made of:**
    - (A) Nichrome
    - (B) Invar
    - (C) Perm invar
    - (D) White metal

46. **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

47. **Mollier diagram is a plot of:**
    - (A) Temperature and entropy
    - (B) Temperature and enthalpy
    - (C) Pressure and enthalpy
    - (D) Enthalpy and entropy

48. **High speed gears are made from plastics of the type:**
    - (A) Fibre glass
    - (B) Capron
    - (C) Foliate
    - (D) Polythene

49. Wood is:
    (A) Homogenous material
    (B) Granular material
    (C) Amorphous material
    (D) Cellular material

50. 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

51. Boring is a method of–
    (A) Generating a hole
    (B) Enlarging a hole
    (C) Finishing a hole
    (D) Drilling a hole

52. 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

53. The clapper block is used in–
    (A) Milling machine
    (B) Lathe machine
    (C) Drilling machine
    (D) Shaping machine

54. 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

55. In CNC machines, G41-Code stands for–
    (A) Cutter compensation-left
    (B) Cutter compensation-right
    (C) Cutter compensation-cancel
    (D) Cutter compensation-double

56. In CNC machines, M09-Code stands for–
    (A) Coolant on
    (B) Coolant off
    (C) Flood coolant on
    (D) Coolant heat up

57. 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

58. **LASER stands for–**
    (A) Light Amplification by Simulated Erosion of Radiation
    (B) Light Amplification by Stimulated Emission of Radiation
    (C) Light Amsorption by Stimulated Emission of Radiation
    (D) Light Amplification by Stimulated Ejection of Radiation

59. **FMS stands for–**
    (A) Flexible Machining Solutions
    (B) Flexible Manufacuring System
    (C) Fundamental Manufacturing System
    (D) Fundamental Machining Solutions

60. **AGV stands for–**
    (A) Autonomous Guided Vehicle
    (B) Automated Guided Vehicle
    (C) Autonomous Guided Variable
    (D) Automated Guided Variable

61. **Railway lines are welded by–**
    (A) Gas welding
    (B) Arc welding
    (C) Resistance welding
    (D) Thermit welding

62. **The commonly used flux in brazing are–**
    (A) Boron carbide
    (B) Ammonium boro-silicate
    (C) Sodium chloride
    (D) Sodium tetraborate decahydrate

63. **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%

64. **In rolling operation, the difference between initial metal thickness and final metal thickness is called–**
    (A) Camber
    (B) Clearance
    (C) Draft
    (D) Allowance

65. **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

66. **Master patterns generally have–**
    (A) Zero shrinkage allowance
    (B) Double shrinkage allowance
    (C) Triple shrinkage allowance
    (D) Negative shrinkage allowance

67. **The accuracy of micrometers, calipers and dial indicators can be check by–**
    (A) Ring gauge
    (B) Plug gauge
    (C) Slip gauge
    (D) Feeler gauge

68. 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

69. 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

70. 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

71. 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

72. 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

73. The cam follower used in automobile engines is–
 (A) Roller
 (B) Flat faced
 (C) Spherical faced
 (D) Knife-edged

74. 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

75. The size of gears is usually specified by–
 (A) Circular pitch
 (B) Outside diameter
 (C) Pitch circle diameter
 (D) Inside diameter

76. The included angle of a pulley for V-belt is–
 (A) 50° – 60°
 (B) 30° – 40°
 (C) 20° – 30°
 (D) 40° – 50°

77. 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) $e^{\mu\theta/\sin \alpha}$

78. Due to slip, the velocity ratio of a belt drive–
    (A) Increases
    (B) Decreases
    (C) Remain same
    (D) None of these

79. For maximum power transmission, the velocity of the belt is–
    (A) $\sqrt{\dfrac{T}{m}}$
    (B) $\sqrt{\dfrac{T}{2m}}$
    (C) $\sqrt{\dfrac{T}{3m}}$
    (D) $\sqrt{\dfrac{T}{4m}}$

80. A Hartnell governor is a –
    (A) Pendulum type governor
    (B) Inertia governor
    (C) Spring loaded governor
    (D) Dead weight governor

81. In a self-locking brake, the force required to apply the brake is –
    (A) Maximum
    (B) Minimum
    (C) Zero
    (D) All of the above

82. If a rotating system is dynamically balanced, it is statically –
    (A) Balanced
    (B) Unbalanced
    (C) Partially balanced
    (D) Unaffected

83. 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

84. 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

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

86. 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%

87. In pneumatic circuits, the full form of FRL –
    - (A) Fully Regulated Lubrication
    - (B) Filler Regulator Lubricator
    - (C) Fitted Regulatory Lubrication
    - (D) Filter Regulator Lubricator

88. 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

89. At break-even point, profit is –
    - (A) Maximum
    - (B) Zero
    - (C) Minimum
    - (D) Negative

90. '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

91. ABC-analysis is based on –
    - (A) Parkinson principle
    - (B) Porter's principle
    - (C) Philip Kotler's principle
    - (D) Pareto principle

92. Who is the founding father of scientific management theory?
    - (A) Frank Gilbreth, Sr.
    - (B) Max Weber
    - (C) Frederick Taylor
    - (D) Lillian Gilbreth

93. 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

94. **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

95. **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

96. **The working principle of thermocouple is based on –**

(A) Compton effect
(B) Photo electric effect
(C) Meissner effect
(D) Seebeck effect

97. **A Zener diode is used as –**

(A) An amplifier
(B) A voltage regulator
(C) A rectifier
(D) A multivibrator

98. **A PN junction acts as a –**

(A) Controlled switch
(B) Bidirectional switch
(C) Unidirectional switch
(D) None of the above

99. **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

100. **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