

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE ASKED TO DO SO.

2020

TEST BOOKLET

TEST BOOKLET SERIES

Time allowed : $1\frac{1}{2}$ hours

Full marks : 100

Answer *all* the questions.

Questions are of equal value.



249

Serial No.

Roll No.:

Signature of the Candidate:

INSTRUCTIONS

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

1. This booklet consists of 12 pages including this front page, Verify the Page Nos. and Test Booklet series on each page and bring at once to the Invigilator's notice any discrepancy.
2. Answers will have to be given in the Special Answer-Sheet supplied for the purpose.
3. Before you proceed to mark in the Answer-Sheet in response to various items in the Test Booklet, you have to fill in some particulars in the Answer-Sheet as per instructions sent to you in the Admit Card. **Do not fold the Answer-Sheet as this will result in error in your marks.**
4. All questions are of multiple-choice answer-type. You will find *four* probable answers (A), (B), (C) and (D) against each question. Find out which of the four answers appears to be correct or the best. Now darken the circle corresponding to the letter of the selected answer in the Answer-Sheet with **Black Ball Point Pen** as per instructions printed on the reverse of the Admit Card and in the Answer-Sheet.
5. One and only one circle is to be fully blackened for answer. Any spot in any other circle (multiple circle) or in wrong circle will be considered as wrong answer.
6. **There will be negative marking of $\frac{1}{3}$ mark for each wrong answer.**
7. There is a blank page at the end of this Booklet for Rough Work.
8. **The Special Answer-Sheet should be handed over to the Invigilator before leaving the Examination Hall. You are permitted to take away the used Test Booklet after completion of the examination.**

1. Pearlite is a combination of
 - (A) ferrite and cementite
 - (B) cementite and gamma iron
 - (C) ferrite and austenite
 - (D) ferrite and iron graphite

2. A particle is projected at such an angle with the horizontal that the maximum height attained by the particle is $\frac{1}{4}$ th of horizontal range. Then the angle of projection is
 - (A) 75°
 - (B) 60°
 - (C) 45°
 - (D) 30°

3. Name the boiler which can generate superheated steam without additional accessories.
 - (A) Lancashire boiler
 - (B) Locomotive boiler
 - (C) Cochran boiler
 - (D) Cornish boiler

4. If a computer has more than one processor then it is known as
 - (A) Multithreaded
 - (B) Multiprogramming
 - (C) Multiprocessor
 - (D) Uniprocess

5. The Young's modulus and the Poisson's ratio for a certain material are 2000 GPa and 0.25 respectively. The bulk modulus of the material will be about
 - (A) 450 GPa
 - (B) 870 GPa
 - (C) 1333 GPa
 - (D) 215 GPa

6. The strain energy stored in a body due to external loading, within elastic limit, is known as
 - (A) malleability
 - (B) ductility
 - (C) toughness
 - (D) resilience

7. A draught of 1mm of water is equivalent to
 - (A) 1N/cm^2
 - (B) 10N/m^2
 - (C) 100N/m^2
 - (D) 1N/mm^2

8. Stroke of an IC Engine equals
 - (A) half the crank radius.
 - (B) the crank radius.
 - (C) twice the crank radius.
 - (D) four times crank radius.

9. The product EI is known as
 - (A) section modulus
 - (B) modulus of rupture
 - (C) flexural rigidity
 - (D) polar modulus

10. The ratio of numbers of teeth and pitch circle diameter is called
 - (A) pitch
 - (B) diametral pitch
 - (C) circular pitch
 - (D) module

11. Isothermal and adiabatic processes are identical at

- (A) absolute zero temperature
- (B) saturation temperature
- (C) critical temperature
- (D) below 0°C temperature

12. 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

13. Full form of URL is

- (A) Uniform Resource Locator
- (B) Uniform Registered Link
- (C) Uniform Registered Locator
- (D) Uniform Resource Link

14. Pure iron is the structure of

- (A) ferrite
- (B) pearlite
- (C) austenite
- (D) ferrite and pearlite

15. Metal patterns are used for

- (A) small castings
- (B) large castings
- (C) precise and intricate castings
- (D) large scale production of castings

16. Efficiency of chimney draught is of the order of

- (A) 8 – 10%
- (B) 5 – 6%
- (C) 2 – 3%
- (D) less than 1%

17. For a heat engine operating on Carnot cycle, the work output is $\frac{1}{4}$ th of the heat rejected to the sink. The thermal efficiency of the engine would be

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

18. For the same compression ratio and heat rejection, which of the following cycles is most efficient?

- (A) Otto cycle
- (B) Diesel cycle
- (C) Dual cycle
- (D) Brayton cycle

19. Free trade zone means trade between

- (A) two countries without tariff
- (B) two manufacturer without tax liability
- (C) manufacturer and consumer
- (D) manufacturer and wholesaler

20. A boat takes 20min and 30min to cover a particular distance downstream and upstream respectively. If the speed of the boat in still water is 20m/s, the speed of stream is

- (A) 4 m/s
- (B) 6 m/s
- (C) 8 m/s
- (D) 9 m/s

Please Turn Over

21. Work ratio is defined as the ratio of
 (A) net work output and turbine work
 (B) net work output and compressor work
 (C) compressor work and turbine work
 (D) actual heat drop and isentropic heat drop in a turbine
22. Iron is
 (A) paramagnetic
 (B) ferromagnetic
 (C) ferroelectric
 (D) dielectric
23. Work output from a system is at the expense of internal energy in a non-flow process carried out
 (A) at constant pressure
 (B) at constant volume
 (C) adiabatically
 (D) polytropically
24. SIMO charts are associated with
 (A) method study
 (B) motion study
 (C) process analysis
 (D) collection of statistical data
25. For irrotational flow
 (A) $\frac{\partial \phi}{\partial x} = \frac{\partial \psi}{\partial y}$
 (B) $\frac{\partial \phi}{\partial y} = \frac{\partial \psi}{\partial x}$
 (C) $\frac{\partial \phi}{\partial y} = -\frac{\partial \psi}{\partial x}$
 (D) $\frac{\partial \phi}{\partial x} = -\frac{\partial \psi}{\partial y}$
26. A circle passing through the pitch point with its centre at the centre of cam axis is known as
 (A) pitch circle
 (B) base circle
 (C) prime circle
 (D) outer circle
27. Which of the following clutches is positive type?
 (A) cone
 (B) disc
 (C) jaw
 (D) centrifugal
28. Which one of the following types of impeller vanes are most commonly used in centrifugal type impellers?
 (A) Forward curved
 (B) Radial
 (C) Backward curved
 (D) Tangential
29. Two reversible isobars and two reversible isotherms constitute the
 (A) Sterling cycle
 (B) Otto cycle
 (C) Atkinson cycle
 (D) Ericsson cycle
30. The angular speed of seconds hand of a clock is
 (A) π rad/s
 (B) $\pi/6$ rad/s
 (C) $\pi/15$ rad/s
 (D) $\pi/30$ rad/s
31. The internal energy of an ideal gas is a function of absolute temperature only. This statement refers to
 (A) Avogadro's Law
 (B) Maxwell Law
 (C) Joule's Law
 (D) Regnault's Law

32. In a two stage reciprocating air compressor, the suction and delivery pressures are 1 bar and 4 bar respectively. For maximum efficiency, the intercooler pressure is

- (A) 1.5 bar
- (B) 2.0 bar
- (C) 2.5 bar
- (D) 3.0 bar

33. For uniform flow around a circular cylinder, the stagnation points are located at

- (A) 0° and 180°
- (B) 0° and 90°
- (C) 90° and 180°
- (D) 90° and 270°

34. A car travels from A to B at V_1 km/hr, travels back from B to A at V_2 km/hr and again goes back from A to B at V_2 km/hr. The average speed of the car is

- (A) $\frac{3V_1V_2}{2V_1 + V_2}$
- (B) $\frac{3V_1V_2}{V_1 + 2V_2}$
- (C) $\frac{2V_1V_2}{V_1 + V_2}$
- (D) $\frac{2V_1V_2}{2V_1 + V_2}$

35. The depth of centre of pressure in a rectangular lamina immersed vertically in water upto a height h is given by

- (A) $\frac{h}{4}$
- (B) $\frac{2h}{3}$
- (C) $\frac{3h}{4}$
- (D) $\frac{h}{2}$

36. The tendency of a material to fracture without appreciable deformation is called

- (A) toughness
- (B) stiffness
- (C) plasticity
- (D) brittleness

37. In a centrifugal compressor, the pressure ratio can be increased by

- (A) decreasing the tip speed
- (B) increasing the tip speed
- (C) raising the inlet temperature
- (D) decreasing the tip speed and raising the inlet temperature

38. The equations of motion for a viscous fluid are known as

- (A) Euler's equation
- (B) Reynolds equation
- (C) Navier-Stokes equation
- (D) Hagen-Poiseuille equation

39. In automobile the power is transmitted from gear box to differential through

- (A) bevel gear
- (B) hooke's joint
- (C) universal joint
- (D) knuckle joint

40. Transient conduction means

- (A) very little heat transfer
- (B) heat transfer for a short time
- (C) heat transfer with a very small temperature difference
- (D) conduction when the temperature at a point varies with time

Please Turn Over

41. What material is used for the insulating body of a spark plug?
- (A) Glass
 - (B) Silica
 - (C) Dolomite
 - (D) Alumina
42. The draught in locomotive boilers is produced by
- (A) chimney
 - (B) steam jet
 - (C) centrifugal fan
 - (D) locomotion
43. The refrigerating system of passenger aircraft works on reversed
- (A) Brayton cycle
 - (B) Atkinson cycle
 - (C) Ericsson cycle
 - (D) Carnot cycle
44. Which of the following equipment is a boiler accessory?
- (A) Stop valve
 - (B) Fusible plug
 - (C) Blow off cock
 - (D) Feed water pump
45. Theoretically the expansion process in the operation of a steam engine is assumed to be
- (A) adiabatic
 - (B) isothermal
 - (C) hyperbolic
 - (D) polytropic
46. One ton of refrigeration is equivalent to
- (A) 1 kW
 - (B) 2.5 kW
 - (C) 3.5 kW
 - (D) 5 kW
47. The kinetic energy of a body is stated to increase by 300%. The corresponding increase in momentum of the body will be
- (A) 50%
 - (B) 100%
 - (C) 200%
 - (D) 300%
48. Typical example of a non-Newtonian fluid of pseudoplastic variety is
- (A) blood
 - (B) water
 - (C) air
 - (D) printing ink
49. A capillary tube is used in a small refrigerator to serve the purpose of
- (A) thermostat
 - (B) expansion valve
 - (C) driver
 - (D) evaporator
50. Critical thickness of insulation for spheres is given by
- (A) K/h
 - (B) $K/4h$
 - (C) $h/2K$
 - (D) $2K/h$

51. The Bernoulli's equation refers to conservation of

- (A) mass
- (B) momentum
- (C) force
- (D) energy

52. The coordinates of the initial and terminal points of a vector are (3, 1, -2) and (4, -7, 10). The magnitude of vector is approximately

- (A) 5.0 units
- (B) 8.1 units
- (C) 14.5 units
- (D) 19.0 units

53. Heat is conducted through a 10 cm thick wall at a rate of 30W/m^2 when the temperature difference across the wall is 10°C . What is the thermal conductivity of the wall material?

- (A) 0.3 Wm/K
- (B) 3.0 Wm/K
- (C) 30 Wm/K
- (D) 0.03 Wm/K

54. The commonly used flux for brazing is

- (A) slag
- (B) borax
- (C) lead
- (D) sodium chloride

55. Work study is done with the help of

- (A) process chart
- (B) material handling
- (C) stop watch
- (D) All of the above

56. Avalanche breakdown is primarily dependent on the phenomenon

- (A) collision
- (B) doping
- (C) ionization
- (D) recombination

57. There is no geometrical distinction between the streamline, pathline and streakline in case of

- (A) steady flow
- (B) uniform flow
- (C) laminar flow
- (D) irrotational flow

58. Stoichiometric (Chemically correct) air fuel ratio for I.C. engine fuels is about

- (A) 10.5
- (B) 14.5
- (C) 16.8
- (D) 18.5

59. A pantograph is a mechanism with

- (A) lower pairs
- (B) higher pairs
- (C) rolling pairs
- (D) turning pairs

60. In general, the vanes of a centrifugal pump are

- (A) curved forward
- (B) curved backward
- (C) radial
- (D) twisted

Please Turn Over

61. The governor used in gramophone is of the following type:
- (A) Pickering
 - (B) Porter
 - (C) Hartnell
 - (D) Watt
62. The top of the piston in two stroke engine is
- (A) flat
 - (B) slanted
 - (C) crown shaped
 - (D) convex shaped
63. Under what conditions, the change in enthalpy of a system equals the heat supplied?
- (A) Constant volume
 - (B) Constant pressure
 - (C) Constant temperature
 - (D) Standard temperature-pressure conditions
64. For maximum power transmission through a pipe line, the frictional head loss equals
- (A) $\frac{H}{4}$
 - (B) $\frac{H}{3}$
 - (C) $\frac{H}{2}$
 - (D) $\frac{3H}{5}$
65. A Pelton Wheel is ideally suited for
- (A) high head and low discharge.
 - (B) high head and high discharge.
 - (C) low head and low discharge.
 - (D) medium head and medium discharge.
66. The bending moment diagram for a simply supported beam carrying a load at the mid span is a
- (A) triangle
 - (B) parabola
 - (C) hyperbola
 - (D) rectangle
67. Incomplete combustion of fuel is characterised by
- (A) high temperature of flue gas.
 - (B) high percentage of oxygen in flue gas.
 - (C) high percentage of carbon dioxide in flue gas.
 - (D) smoky exhaust.
68. Compared to four stroke cycle engine, a two stroke cycle engine
- (A) has lower fuel consumption.
 - (B) can be easily started.
 - (C) is smaller in size for the same output.
 - (D) has lesser shocks and vibrations.
69. A transformer core is laminated to
- (A) reduce hysteresis loss
 - (B) reduce eddy current loss
 - (C) reduce copper loss
 - (D) reduce all of the above
70. The free convection heat transfer is significantly affected by
- (A) Reynolds number
 - (B) Prandtl number
 - (C) Grashoff number
 - (D) Stanton number

71. All liquid surfaces tend to stretch. This phenomenon is called
- (A) cohesion
 - (B) adhesion
 - (C) surface tension
 - (D) cavitation
72. Piston compression rings are made of
- (A) cast iron
 - (B) bronze
 - (C) aluminium
 - (D) white metal
73. Newton's first law of motion gives the concept of
- (A) work
 - (B) force
 - (C) inertia
 - (D) energy
74. Roots blower is an example of
- (A) rotary (positive displacement) compressor
 - (B) reciprocating (positive displacement) compressor
 - (C) centrifugal compressor
 - (D) axial flow compressor
75. Oxygen can be removed from the boiler feed water by the addition of
- (A) alum
 - (B) calcium carbonate
 - (C) sodium sulphite
 - (D) cuprous chloride
76. Most commonly used lubricant in automobile engines is
- (A) vegetable oil
 - (B) mineral oil
 - (C) animal oil
 - (D) synthetic oil
77. For a streamline flow velocity at a certain point is
- (A) constant.
 - (B) a function of time only.
 - (C) constant but depends on time.
 - (D) constant and independent of time.
78. The commercially available petrol in India has an octane rating of
- (A) 85-90
 - (B) 60-75
 - (C) 40-50
 - (D) 20-30
79. Amongst the following substances, which is most elastic?
- (A) Steel
 - (B) Rubber
 - (C) Brass
 - (D) Aluminium
80. Dies for wire drawing are made of
- (A) cast iron
 - (B) wrought iron
 - (C) mild steel
 - (D) carbides

Please Turn Over

81. Bevel gears have their teeth
(A) straight over the wheel rim
(B) inclined to wheel rim
(C) curved over the wheel rim
(D) cut on the surfaces of the frusta of cones
82. For simple harmonic motion of the cam follower a cosine curve represents
(A) displacement diagram
(B) acceleration diagram
(C) velocity diagram
(D) torque diagram
83. Intercooling in multistage compression reduces
(A) the volume of free air delivered
(B) the pressure of air at delivery
(C) the work input to compressor
(D) index of compression
84. Reciprocating compressors are provided with
(A) Simple disc/Plate valve
(B) Poppet valve
(C) Spring loaded disc valve
(D) Solenoid valve
85. The ratio of the polar moment of inertia to the radius of the shaft is known as
(A) torsional rigidity
(B) torsional section modulus
(C) flexural rigidity
(D) shaft stiffness
86. The RMS value of sin wave is 100 A. Its peak value is
(A) 70.7 A
(B) 141 A
(C) 150 A
(D) 282.8 A
87. Which of the following rotary compressor has shafts?
(A) Centrifugal compressor
(B) Axial flow compressor
(C) Lobe type compressor
(D) Sliding vane compressor
88. ABC analysis is used in
(A) job analysis
(B) production schedule
(C) inventory control
(D) simulation
89. Master cylinder in an automobile is associated with
(A) Steering
(B) Braking
(C) Lubrication
(D) Suspension
90. The escape velocity of an object from the surface of earth is about
(A) 2.2 km/s
(B) 5.5 km/s
(C) 11.2 km/s
(D) 7.8 km/s

91. An adjustable propeller turbine is called
 (A) Pelton turbine
 (B) Francis-Pelton turbine
 (C) Kaplan turbine
 (D) Banki turbine
92. The alpha (α) and beta (β) of a transistor are related to each other as
 (A) $\alpha = \frac{\beta}{\beta+1}$
 (B) $\beta = \frac{\alpha}{1+\alpha}$
 (C) $\beta = \frac{1+\alpha}{\alpha}$
 (D) $\alpha = \frac{1+\beta}{\beta}$
93. William's line for the steam engine is a straight line relationship between rate of steam consumption and
 (A) brake power
 (B) indicated power
 (C) efficiency
 (D) pressure of steam
94. The tool used for lifting the pattern from the mould is called
 (A) lifter
 (B) slick
 (C) draw spike
 (D) trowel
95. When a wire is stretched to double its length, the longitudinal strain produced in it is
 (A) 0.5
 (B) 1.0
 (C) 1.5
 (D) 2.0
96. When a bullet is fired from a gun, it is recoiled in the backward direction. It is due to
 (A) impulse
 (B) inertia
 (C) conservation of momentum
 (D) conservation of energy
97. The ratio of maximum shear stress to average shear stress for a beam with circular section is
 (A) 3 : 1
 (B) 2 : 1
 (C) 3 : 2
 (D) 4 : 3
98. Two forces of equal magnitude P act at an angle θ to each other. Their resultant is equal to
 (A) $2P \sin \frac{\theta}{2}$
 (B) $2P \cos \frac{\theta}{2}$
 (C) $2P \cos \theta$
 (D) $P \cos 2\theta$
99. The air fuel ratio for a gas turbine is generally kept closer to
 (A) 20 : 1
 (B) 30 : 1
 (C) 40 : 1
 (D) 60 : 1
100. For the same compression ratio, the efficiency of Brayton cycle is
 (A) equal to diesel cycle.
 (B) equal to otto cycle.
 (C) equal to dual cycle.
 (D) greater than diesel cycle.

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A-12

Space for Rough Work

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