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

Test Booklet No. :

Series

02201

TEST BOOKLET

Paper—II

(MECHANICAL ENGINEERING)

A

SEAL

Time Allowed : 2 Hours   **Full Marks : 100**

Read the following instructions carefully before you begin to answer the questions :

1. The name of the Subject, Roll Number as mentioned in the Admission Certificate, Test Booklet No. and Series are to be written legibly and correctly in the space provided on the Answer-Sheet with Black/Blue ballpoint pen.

2. **Answer-Sheet without marking Series as mentioned above in the space provided for in the Answer-Sheet shall not be evaluated.**

3. All questions carry equal marks.
   The Answer-Sheet should be submitted to the Invigilator.
   Directions for giving the answers : Directions for answering questions have already been issued to the respective candidates in the 'Instructions for marking in the OMR Answer-Sheet' along with the Admit Card and Specimen Copy of the OMR Answer-Sheet.
   Example :
   Suppose the following question is asked :
   The capital of Bangladesh is
   (A) Chennai
   (B) London
   (C) Dhaka
   (D) Dhubri
   You will have four alternatives in the Answer-Sheet for your response corresponding to each question of the Test Booklet as below :

   (A) (B) (C) (D)

   In the above illustration, if your chosen response is alternative (C), i.e., Dhaka, then the same should be marked on the Answer-Sheet by blackening the relevant circle with a Black/Blue ballpoint pen only as below :

   (A) (B) ● (D)

   The example shown above is the only correct method of answering.

4. Use of eraser, blade, chemical whitener fluid to rectify any response is prohibited.

5. Please ensure that the Test Booklet has the required number of pages (16) and 100 questions immediately after opening the Booklet. In case of any discrepancy, please report the same to the Invigilator.

6. No candidate shall be admitted to the Examination Hall/Room 20 minutes after the commencement of the examination.

7. No candidate shall leave the Examination Hall/Room without prior permission of the Supervisor/ Invigilator. No candidate shall be permitted to hand over his/her Answer-Sheet and leave the Examination Hall/Room before expiry of the full time allotted for each paper.

8. No Mobile Phone, Electronic Communication Device, etc., are allowed to be carried inside the Examination Hall/Room by the candidates. Any Mobile Phone, Electronic Communication Device, etc., found in possession of the candidate inside the Examination Hall/Room, even if on off mode, shall be liable for confiscation.

9. No candidate shall have in his/her possession inside the Examination Hall/Room any book, notebook or loose paper, except his/her Admission Certificate and other connected papers permitted by the Commission.

10. Complete silence must be observed in the Examination Hall/Room. No candidate shall copy from the paper of any other candidate, or permit his/her own paper to be copied, or give, or attempt to give, or obtain, or attempt to obtain irregular assistance of any kind.

11. This Test Booklet can be carried with you after answering the questions in the prescribed Answer-Sheet.

12. Noncompliance with any of the above instructions will render a candidate liable to penalty as may be deemed fit.

13. No rough work is to be done on the OMR Answer-Sheet. You can do the rough work on the space provided in the Test Booklet.

N.B. : There will be negative marking @ 0·25 per 1 (one) mark against each wrong answer.

/47   **[No. of Questions : 100**

1. For placing of dimensions in engineering drawing, there are _____ number(s) of system(s).

   (A) three

   (B) two

   (C) four

   (D) one

2. There are _____ types of scales used in practice of engineering drawing.

   (A) four

   (B) three

   (C) two

   (D) five

3. The gravitational field intensity is maximum

   (A) at the equator

   (B) at the pole

   (C) at the centre of the earth

   (D) at a height above the surface

4. The resultant of force acting on a body will be zero, if the body

   (A) rotates

   (B) does not rotate

   (C) moves along a curved path

   (D) rotates with uniform acceleration

5. A passenger train takes two hours less for a journey of 300 km if its speed is increased by 5 km/hr over its usual speed. Then what is the usual speed?

   (A) 15 km/hr

   (B) 29 km/hr

   (C) 25 km/hr

   (D) 30 km/hr

6. The motion of a bicycle wheel is

   (A) linear

   (B) rotatory

   (C) translatory

   (D) rotatory as well as translatory

7. Newton's first law of motion gives the concept of

   (A) work

   (B) force

   (C) inertia

   (D) energy

8. The moment of inertia of a body does **not** depend upon

(A) mass of the body

(B) the angular velocity of a body

(C) the axis of rotation of the body

(D) None of the above

9. A non-reversible machine has efficiency

(A) nearly 100%

(B) between 75% and 99%

(C) more than 50%

(D) less than 50%

10. The moment of inertia of an area is always least with respect to

(A) centroidal axis

(B) vertical axis

(C) radius of gyration

(D) Depends upon configuration of the area

11. The unit of the moment of inertia of an area is

(A) kg-m

(B) kg-m^2

(C) kg-m^4

(D) m^4

12. The CG of a triangle lies at the point of intersection of

(A) diagonals

(B) altitudes

(C) bisectors of angles

(D) medians

13. In simple harmonic motion, the acceleration is proportional to

(A) displacement

(B) linear velocity

(C) angular velocity

(D) energy

14. A body moving around a fixed axis constitutes

(A) curvilinear motion

(B) circular motion

(C) plane motion

(D) simultaneous translation and rotation

15. Stiffness of a material is expressed in terms of

(A) mass density

(B) hardness number

(C) impact strength

(D) modulus of elasticity

16. Toughness of a material signifies

(A) strength

(B) softness

(C) brittleness

(D) lower yield point

17. The statement, Stress is proportional to strain, i.e., Hooke's law hold goods up to

(A) elastic limit

(B) limit of proportionality

(C) upper yield point

(D) lower yield point

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

(A) toughness

(B) stiffness

(C) plasticity

(D) brittleness

19. The shear force at certain section of a beam is stated to be zero. The bending moment at that section will be

(A) minimum

(B) maximum

(C) zero

(D) either minimum or maximum

20. A structural member subjected to an axial compressive force is called

(A) beam

(B) column

(C) frame

(D) strut

21. 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

22. Slenderness ratio of a column is defined as the ratio of its length to its

(A) least radius of gyration

(B) least lateral dimension

(C) maximum lateral dimension

(D) maximum radius of gyration

23. Young's modulus of elasticity for a perfectly rigid body is

(A) zero

(B) unity

(C) infinity

(D) some infinite non-zero constant

24. Hoop stress is

(A) radial stress

(B) compressive stress

(C) longitudinal stress

(D) circumferential tensile stress

25. The stress at neutral axis is

(A) zero

(B) maximum tensile

(C) minimum compressive

(D) minimum tensile

26. The moment of inertia of an area will be least with respect to

(A) central axis

(B) horizontal axis

(C) vertical axis

(D) moment of area same through all axes

27. If a column fails due to buckling, it is likely to be a

(A) long column

(B) short column

(C) strut

(D) reinforced column

28. Modulus of rigidity is the ratio of

(A) axial stress to lateral strain

(B) linear stress to longitudinal strain

(C) shear stress to shear strain

(D) hydrostatic stress to volumetric strain

29. An ideal fluid

(A) has no viscosity

(B) satisfies the relation $PV = RT$

(C) obeys the Newton's law of viscosity

(D) is both incompressible and non-viscous

30. The general energy equation is applicable to

(A) steady flow

(B) unsteady flow

(C) turbulent flow

(D) laminar flow

31. Bernoulli's theorem deals with the principle of conservation of

(A) force

(B) energy

(C) mass

(D) momentum

32. The equation of continuity of flow is based on the principle of conservation of

(A) momentum

(B) energy

(C) mass

(D) None of the above

33. A Pitot tube is used for the measurement of

(A) viscosity

(B) pressure

(C) surface tension

(D) velocity

34. Capillary action is due to the

(A) viscosity of liquid

(B) cohesion of liquid particles

(C) surface tension

(D) None of the above

35. In a centrifugal pump casing, the flow of water conforms to

(A) radial flow

(B) free vortex flow

(C) spiral flow

(D) forced vortex motion

36. The pressure drop in a pipe flow is directly proportional to the mean velocity. It is suggested that the

(A) flow is laminar

(B) flow is turbulent

(C) pipe is smooth

(D) pipe is rough

37. The centre of gravity of the volume of liquid displaced by an immersed body is called

(A) wet CG

(B) centre of buoyancy

(C) metacentre

(D) wet centre

38. Atmospheric pressure held in terms of water column is

(A) 7·5 m

(B) 8·5 m

(C) 9·81 m

(D) 10·30 m

39. One-dimensional flow means

(A) uniform flow

(B) steady flow

(C) straight line flow

(D) flow which neglects changes in transverse direction

40. In the boundary layer, the flow is

(A) viscous and rotational

(B) inviscid and irrotational

(C) inviscid and rotational

(D) viscous and irrotational

41. At the point of boundary layer separation

(A) shear stress is maximum

(B) shear stress is zero

(C) velocity is negative

(D) density variation is maximum

42. Surface tension is due to

(A) cohesion only

(B) adhesion only

(C) cohesion and adhesion only

(D) neither cohesion nor adhesion

43. The continuity equation represents conservation of

(A) mass

(B) momentum

(C) energy

(D) vortices

44. In automobiles, Hooke's point is used between which of the following?

(A) Clutch and gearbox

(B) Gearbox and differential

(C) Differential and wheel

(D) Flywheel and clutch

45. A ball and socket joint constitutes a spherical pair having _____ degree(s) of freedom.

(A) no

(B) one

(C) two

(D) three

46. Cam and follower mechanism constitutes a kinematic pair of the types

(A) lower and open

(B) higher and open

(C) lower and closed

(D) higher and closed

47. A pair is termed as higher pair when relative motion between two elements of the pair is

(A) turning only

(B) sliding only

(C) rolling only

(D) partly sliding and partly turning

48. The gears employed for connecting two non-intersecting and non-parallel, i.e., non-coplanar shafts are

(A) bevel gears

(B) spiral gears

(C) helical gears

(D) miter gears

49. A kinematic chain becomes a mechanism when

(A) first link is fixed

(B) all links are fixed

(C) any one of the links is fixed

(D) None of the links is fixed

50. In a kinematic chain, the minimum number of kinematic pairs required is

(A) one

(B) two

(C) three

(D) four

51. The function of a governor is to

(A) smoothen the cyclic fluctuations of speed

(B) help to start the engine

(C) take care of output fluctuations and control the input accordingly

(D) store up energy and give up the same whenever required during a cycle

52. A flywheel influences the

(A) mean speed of the engine

(B) mean torque developed by the engine

(C) variation of load demand on the engine

(D) cyclic fluctuations of speed when delivering constant output

53. When a cone is cut by planes at different angles, the curves of intersection are called

(A) cycloid

(B) involute

(C) trochoid

(D) conic

54. The section view drawing in which one-fourth of an object has been marked for removal is known as a _____ section.

(A) full

(B) half

(C) quarter

(D) None of the above

55. Which is an angled surface used on cylinders to make them easier to handle?

(A) Fillet

(B) Taper

(C) Lug

(D) Chamfer

56. The type of line that projects from an object for the express purpose of locating a dimension is a/an _____ line.

(A) visible

(B) hidden

(C) extension

(D) dimension

57. Welding drawing is a special type of which kind of drawing?

(A) Symbol

(B) Assembly

(C) Perspective

(D) Isometric

58. Drafters should use a _____ in a section view of a mechanical part that includes the cylindrical view of a threaded hole.

(A) centre line

(B) hatch line

(C) polyline

(D) dimension line

59. Objects that are symmetric can be shown effectively using which type of section?

(A) Quarter section

(B) Half section

(C) Full section

(D) Symmetric section

60. The gears transmit power between shafts whose axes intersect at any angle are

(A) worm gears

(B) spur gears

(C) bevel gears

(D) racks

61. In isometric projections, all distances are approximately which percentage of their true size?

(A) 120 percent

(B) 80 percent

(C) 50 percent

(D) 20 percent

62. What is the type of triangle if the sides of a triangle are unequal?

(A) Isosceles triangle

(B) Acute triangle

(C) Equilateral triangle

(D) Scalene triangle

63. What is the quadrilateral if all the four sides are equal but only the opposite angles are equal?

(A) Rectangle

(B) Rhombus

(C) Trapezoid

(D) Square

64. The first law of thermodynamics refers to conservation of

(A) energy

(B) mass

(C) force

(D) momentum

65. Heat supplied to a system equals the work done in case of a non-flow process carried out

(A) isochorically

(B) isobarically

(C) isothermally

(D) adiabatically

66. 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

67. A gas turbine works on

(A) Rankine cycle

(B) Carnot cycle

(C) Otto cycle

(D) Brayton cycle

68. Expansion of hot gases in an IC engine can be approximated to an

(A) isothermal process

(B) adiabatic process

(C) isobaric process

(D) isochoric process

69. Which one of the following thermodynamic processes approximate the steaming of food in a pressure cooker?

(A) Isenthalpic

(B) Isobaric

(C) Isochoric

(D) Isothermal

70. For steady flow through an insulated horizontal constant diameter pipe, which property remains constant?

(A) Enthalpy

(B) Internal energy

(C) Entropy

(D) Volume

71. A heat engine is supplied with 2512 kJ/min of heat at 650 °C. Heat rejection with 900 kJ/min takes place at 100 °C. This type of heat engine is

(A) ideal

(B) irreversible

(C) impossible

(D) practical

72. Isothermal and adiabatic processes are identical

(A) at saturation temperature

(B) at critical temperature

(C) below 0 °C temperature

(D) at absolute zero temperature

73. A process which does **not** dissipate available energy is known as

(A) adiabatic process

(B) isothermal process

(C) ideal process

(D) frictionless process

74. The ability of gasoline to resist detonation during combustion is given by

(A) octane number

(B) cetane number

(C) iso-octane number

(D) heptane number

75. The value of extensive property is essentially dependent on

(A) mass or extent of the system

(B) interaction of system with its surroundings

(C) nature of boundaries, rigid or flexible

(D) path followed by the system going from one state to another

76. The artificial draught normally designed to produce

(A) less smoke

(B) more draught

(C) less chimney gas temperature

(D) All of the above

77. In jet type condensers

(A) cooling water passes through tubes and steam surrounds them

(B) steam passes through tubes and cooling water surrounds them

(C) steam and cooling water mix

(D) steam and cooling water do not mix

78. Compounding of steam turbine is done for

(A) reducing the work done

(B) increasing the rotor speed

(C) reducing the rotor speed

(D) balancing the turbine

79. India's first nuclear power plant was installed at

(A) Tarapur

(B) Kota

(C) Kalpakkam

(D) None of the above

80. The average ash content in Indian coal is about

(A) 5%

(B) 10%

(C) 15%

(D) 20%

81. Which of the following safety devices is used to protect the boiler when the water level falls below a minimum level?

(A) Water level indicator

(B) Fusible plug

(C) Blow-off cock

(D) Safety valve

82. _____ is a water-tube boiler.

(A) Benson

(B) Stirling

(C) Cochran

(D) LaMont

83. The major shortcoming of fire-tube boiler is

(A) high cost

(B) requirement of high draught

(C) need of highly skilled labour

(D) size and pressure limitation inherent in design

84. The angle between face and flank of the single point cutting tool is known as

(A) rake angle

(B) clearance angle

(C) lip angle

(D) point angle

85. The purpose of providing side rake angle on the cutting tool is to

(A) control chip flow

(B) strengthen tool edge

(C) break chip

(D) avoid work from rubbing against tool

86. In a machining process, the percentage of heat carried away by the chip is typically

(A) 5%

(B) 25%

(C) 50%

(D) 75%

87. Which of the following methods should be used for turning internal tapers only?

(A) Tailstock offset

(B) Taper attachment

(C) Form tool

(D) Compound rest

88. Removal of metal by feeding the work part a rotating multipoint cutter is known as

(A) grinding

(B) broaching

(C) milling

(D) burnishing

89. Grinding is a _____ operation.

(A) facing

(B) forming

(C) dressing

(D) surface finishing

90. In which operation tool does *not* rotate?

(A) Planning

(B) Grinding

(C) Drilling

(D) Milling

91. Which of the following is a type of fusion welding?

(A) Ultrasonic welding

(B) Friction welding

(C) Carbon arc welding

(D) Forge welding

92. Which of the following is a solid-state welding?

(A) Projection, ultrasonic and electron beam welding

(B) Friction stir, projection and laser beam welding

(C) Projection, ultrasonic and diffusion welding

(D) explosive, diffusion and electron beam welding

93. In AutoCAD, the 3-D commands on the modelling toolbar include

(A) sphere

(B) extrude

(C) box

(D) All of the above

94. The rotational analogue of force in linear motion is

(A) couple

(B) torque

(C) moment of momentum

(D) moment of inertia

95. The slope on the road generally provided on the curves is known as

(A) angle of repose

(B) angle of friction

(C) angle of banking

(D) angle of reaction

96. The radius of gyration of a circular area of radius r with respect to centroidal axis is

(A) $0 \cdot 1r$

(B) $0 \cdot 2r$

(C) $0 \cdot 5r$

(D) $0 \cdot 7r$

97. The locus of instantaneous centre of a moving rigid body is

(A) involute

(B) cycloid

(C) epicycloid

(D) centroid

98. Which of the following is a fire-tube boiler?

(A) Babcock and Wilcox

(B) Stirling

(C) Cochran

(D) None of the above

99. The unit of force in SI system is

(A) newton

(B) dyne

(C) kgf

(D) newton-metre

100. Which of the following is *not* a vector quantity?

(A) Force

(B) Displacement

(C) Distance

(D) Weight

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