22/02/2026

EJ/EPH/EM/II/25/12

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

Test Booklet No. : 01393

Series A

TEST BOOKLET

MECHANICAL ENGINEERING

Time Allowed : 3 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 :

   Ⓐ Ⓑ Ⓒ Ⓓ

   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 :

   Ⓐ Ⓑ ● Ⓓ

   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.

SEAL

[No. of Questions : 100]

1. Resolution of a force means

(A) changing the direction of a force without altering magnitude

(B) combining multiple forces to form a single resultant

(C) splitting a force into components without changing its effect

(D) reducing the magnitude of a force in given direction

2. A force of 100 N is acting at a point making an angle of 30° with the horizontal. If the force is resolved in two components namely F_x and F_y along horizontal (x-axis) and vertical (y-axis) directions, then F_y component of the force in vertical direction will be

(A) 100 sin 60°

(B) 100 sin 30°

(C) 100 cos 60°

(D) 100 cos 30°

3. A small block of weight 100 N is placed on an inclined plane which makes an angle $\theta = 45°$ with the horizontal. The component of the weight perpendicular to the inclined plane will be

(A) 100 sin 45°

(B) 100 sin 60°

(C) 100 cos 45°

(D) 100 tan 45°

4. The angle of inclination of the plane at which the body begins to move down the plane is called

(A) angle of friction

(B) angle of repose

(C) angle of projection

(D) None of the above

5. A body of weight 200 N is placed on a rough horizontal plane. If the coefficient of friction between the body and the horizontal plane is 0·3, the horizontal force required to just slide the body on the plane is

(A) 70 N (B) 45 N

(C) 60 N (D) 95 N

6. Triangular shape frame is a/an _____ frame.

(A) imperfect (B) deficient

(C) perfect (D) redundant

7. The law of a machine is defined by an equation which gives the relationship between the

(A) effort required and the corresponding load

(B) mechanical advantage and the corresponding load

(C) lifting machine and the load

(D) effort and the efficiency of the machine

8. A machine having an efficiency less than 50% is known as

(A) reversible machine

(B) non-reversible machine

(C) ideal machine

(D) None of the above

9. The wheel of a moving car possesses

(A) potential energy only

(B) kinetic energy of translation only

(C) kinetic energy of rotation only

(D) kinetic energy of translation and rotation both

10. Bending moment in a beam is maximum when the

(A) shear force is minimum

(B) shear force is maximum

(C) shear force is zero

(D) shear force is constant

11. The point of contraflexure is a point where

(A) bending moment changes sign

(B) bending moment is maximum

(C) bending moment is minimum

(D) shear force is zero

12. Sagging bending moment occurs at the _____ of the beam.

(A) supports

(B) mid span

(C) point of contraflexure

(D) point of emergence

13. The area moment of inertia of a triangular section of base b and height h about an axis through its base is

(A) $\frac{bh^3}{4}$

(B) $\frac{bh^3}{8}$

(C) $\frac{bh^3}{12}$

(D) $\frac{bh^3}{36}$

14. The stress acts tangential to circumference is called _____ stress.

(A) hoop

(B) fluid

(C) longitudinal

(D) yield

15. When is a fluid called turbulent?

(A) High viscosity of fluid

(B) Reynolds number is greater than 2000

(C) Reynolds number is less than 2000

(D) The density of the fluid is low

16. The compressible flow is assumed to be

(A) adiabatic only

(B) isentropic only

(C) isentropic and adiabatic both

(D) polytropic

17. An ideal flow of any fluid must fulfill which of the following?

(A) Newton's law of motion

(B) Newton's law of viscosity

(C) Continuity equation

(D) Boundary layer theory

18. The pressure of a liquid measured with the help of a piezometer tube is

(A) vacuum pressure

(B) atmospheric pressure

(C) absolute pressure

(D) gauge pressure

19. Bernoulli's equation is applied to

(A) venturi meter

(B) orifice meter

(C) pitot tube meter

(D) All of the above

20. Reynolds number is the ratio of the inertia force to the

(A) gravitational force

(B) surface tension

(C) viscous force

(D) elasticity

21. According to the principle of buoyancy, a body totally or partially immersed in fluid will be lifted up by a force equal to

(A) the weight of the body

(B) more than the weight of the body

(C) less than the weight of the body

(D) weight of the fluid displaced by the body

22. When a fluid is flowing past an immersed body, and at a point on the body if the resultant velocity becomes zero, the point is called

(A) Mach point

(B) static point

(C) stagnation point

(D) zero point

23. The surface tension of mercury at normal temperature compared to that of water is

(A) more

(B) less

(C) same

(D) more or less depending on size of glass tube

24. A fluid in equilibrium cannot sustain

(A) tensile stress

(B) compressive stress

(C) shear stress

(D) bending stress

25. A balloon lifting in air follows which of the following principles?

(A) Law of gravitation

(B) Archimedes principle

(C) Principle of buoyancy

(D) All of the above

26. The stress-strain relation of the Newtonian fluid is

(A) linear

(B) parabolic

(C) hyperbolic

(D) inverse type

27. _____ is an inversion of double-slider crank chain.

(A) Coupling rod of locomotive

(B) Scotch yoke mechanism

(C) Hand pump

(D) Reciprocating engine

28. A higher pair has

(A) point contact

(B) surface contact

(C) no contact

(D) None of the above

29. The relation between number of pairs p forming a kinematic chain and the number of links l is

(A) $l = 2p - 2$

(B) $l = 2p - 3$

(C) $l = 2p - 4$

(D) $l = 2p - 5$

30. The efficiency of a screw jack is maximum, when

(A) $\alpha = 45° + \frac{\phi}{2}$

(B) $\alpha = 45° - \frac{\phi}{2}$

(C) $\alpha = 90° + \phi$

(D) $\alpha = 90° - \phi$

where α = Helix angle and ϕ = angle of friction.

31. The module of a gear is

(A) $\frac{D}{T}$

(B) $\frac{T}{D}$

(C) $\frac{2D}{T}$

(D) $\frac{2T}{D}$

32. The centrifugal tension in belt

(A) increases power transmitted

(B) decreases power transmitted

(C) have no effect on power transmitted

(D) increases the belt tension without increasing power transmission

33. The ratio of height of porter governor (when length of arms and links are equal) to the height of watt governor is

(A) $\frac{(m+M)}{m}$

(B) $\frac{M}{(m+M)}$

(C) $\frac{m}{(m+M)}$

(D) None of the above

where m is the mass of the ball and M is the mass of the sleeve.

34. A porter governor is a/an

(A) pendulum type governor

(B) dead weight governor

(C) spring loaded governor

(D) inertia governor

35. The size of a gear is usually specified by

(A) pressure angle

(B) circular pitch

(C) diametral pitch

(D) pitch circle diameter

36. The critical speed of a shaft depends upon its

(A) mass

(B) stiffness

(C) mass and stiffness

(D) stiffness and eccentricity

37. Drawing showing the position of each part with respect to each other is called

(A) assembly drawing

(B) part drawing

(C) machine drawing

(D) installation drawing

38. Detailed drawing of each part of a machine is called

(A) part drawing

(B) assembly drawing

(C) patent drawing

(D) tabular drawing

39. Isometric drawings are often used by _____ to help illustrate complex designs.

(A) mechanical engineers

(B) piping drafters

(C) aerospace engineers

(D) All of the above

40. A line drawn with a long section, short dash and another long section is a

(A) hidden feature

(B) center of a circle

(C) center axis of a hidden cylinder

(D) center of a radius

41. The angle between the isometric axes is

(A) 180°

(B) 120°

(C) 90°

(D) 60°

42. A hexagon is placed parallel to vertical plane. Which of the following projections is true?

(A) Front view—line, top view—hexagon

(B) Front view—hexagon, top view—line

(C) Front view—line, top view—line

(D) Top view—hexagon, side view—line

43. In an isothermal process

(A) internal energy increases

(B) internal energy decreases

(C) there is no change in internal energy

(D) None of the above

44. Work done in a free expansion process is

(A) zero

(B) positive

(C) negative

(D) maximum

45. The area under the temperature-entropy curve (T-s curve) of any thermodynamic process represents

(A) heat absorbed

(B) heat rejected

(C) Either (A) or (B)

(D) None of the above

46. In Carnot cycle, heat is received at _____ temperature.

(A) lower

(B) higher

(C) constant

(D) None of the above

47. When the temperature difference increases, the coefficient of performance (COP) of a Carnot heat pump

(A) increases

(B) decreases

(C) first increases, then decreases

(D) None of the above

48. Carnot cycle has maximum efficiency for

(A) reversible engine

(B) irreversible engine

(C) petrol engine

(D) diesel engine

49. Which of the following items is not a path function?

(A) Heat

(B) Work

(C) Kinetic energy

(D) Thermal conductivity

50. In thermodynamics, standard fixed point is

(A) vapour point of water

(B) ice point of water

(C) boiling point of H_2

(D) triple-point of water

51. If m_1 and m_2 are the masses of liquid and vapour respectively in a liquid-vapour mixture, then what is the formula for dryness fraction x?

(A) $x = \frac{(m_1 + m_2)}{m_1}$

(B) $x = \frac{(m_1 + m_2)}{m_2}$

(C) $x = \frac{m_1}{(m_1 + m_2)}$

(D) $x = \frac{m_2}{(m_1 + m_2)}$

52. What is the dryness fraction x for saturated water, when water just starts boiling?

(A) $x = 0$

(B) $x = 1$

(C) $x = 0 \cdot 9$

(D) $x = 0 \cdot 5$

53. The graphical representation of transformation of 1 kg of ice into 1 kg of superheated steam at constant pressure is known as

(A) *u-v* diagram

(B) *h-s* diagram

(C) *p-v* diagram

(D) *t-h* diagram

54. _____ is a boiler mounting.

(A) Injector

(B) Economizer

(C) Superheater

(D) Fusible plug

55. Gas turbine is also known as

(A) steam turbine

(B) combustion turbine

(C) velocity turbine

(D) None of the above

56. Gas turbines work on which of the following cycles?

(A) Otto cycle

(B) Diesel cycle

(C) Rankine cycle

(D) Brayton cycle

57. Reheating of steam

(A) decreases steam rate

(B) increases steam rate

(C) No effect on steam rate

(D) None of the above

58. The efficiency of diesel cycle increases with

(A) decrease in cut-off

(B) increase in cut-off

(C) constant cut-off

(D) None of the above

59. The thermal efficiency of diesel engines is about

(A) 15%

(B) 30%

(C) 50%

(D) 70%

60. Which of the following gases has the highest calorific value?

(A) Coal gas

(B) Producer gas

(C) Mond gas

(D) Blast furnace gas

61. What is a hydropower plant?

(A) It produces mechanical energy from the moving water currents

(B) It produces electrical energy from the stagnant water currents

(C) It produces potential energy from the moving water currents

(D) It produces electrical energy from the moving water currents

62. Where was India's first nuclear power plant installed?

(A) Obninsk

(B) Tarapur, Maharashtra

(C) Boisar, Maharashtra

(D) None of the above

63. Rankine efficiency of a steam power plant

(A) improves in summer as compared to that in winter

(B) improves in winter as compared to that in summer

(C) is unaffected by climatic conditions

(D) None of the above

64. The draught produced by chimney of given height at given outside temperature

(A) decreases if the chimney gas temperature increases

(B) increases if the chimney gas temperature increases

(C) remains same irrespective of chimney gas temperature

(D) may increase or decrease

65. 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

66. In Rankine cycle, the work output from the turbine is given by

(A) change of internal energy between inlet and outlet

(B) change of enthalpy between inlet and outlet

(C) change of entropy between inlet and outlet

(D) change of temperature between inlet and outlet

67. A single-stage impulse turbine is also known as

(A) Curtis stage turbine

(B) reaction turbine

(C) De Laval turbine

(D) Rateau turbine

68. The pressure ratio per stage for a centrifugal compressor is

(A) 16 : 1

(B) 10 : 1

(C) 8 : 1

(D) 4 : 1

69. Jigs and fixtures are used for

(A) mass production

(B) identical parts production

(C) Both (A) and (B)

(D) None of the above

70. Which of the following is/are the function(s) of a jig?

(A) Holding

(B) Locating

(C) Guiding

(D) All of the above

71. The angle on which the strength of the tool depends is

(A) rake angle

(B) cutting angle

(C) clearance angle

(D) lip angle

72. In grinding to get good surface finish, the grain size of the abrasive used is

(A) coarse

(B) fine

(C) Grain size does not affect surface finish

(D) None of the above

73. Grinding of hard materials requires

(A) fine grit size and hard grades

(B) fine grit size and soft grades

(C) coarse grit size and soft grades

(D) coarse grit size and hard grades

74. Continuous chips with built-up edge are formed during machining of

(A) brittle metals

(B) ductile metals

(C) hard metals

(D) soft metals

75. Tool signature consists of _____ elements.

(A) two

(B) four

(C) five

(D) seven

76. Tumbler gear in lathe is used to

(A) reduce the spindle speed

(B) cut gears

(C) give desired direction of movement to the lathe carriage

(D) drill a workpiece

77. The lead screw of a lathe has _____ threads.

(A) single start

(B) double start

(C) multi-start

(D) None of the above

78. In shaper machine

(A) tool is stationary while workpiece reciprocates

(B) workpiece is stationary while tool reciprocates

(C) both the tool and workpiece reciprocate

(D) both the tool and workpiece rotate

79. The size of a shaper is given by

(A) stroke length

(B) motor power

(C) mass of machine

(D) rate size

80. Which type of mechanism is used in shaper machine?

(A) Indexing mechanism

(B) Four-bar mechanism

(C) Quick return mechanism

(D) None of the above

81. In drilling operation, the metal is removed by

(A) shearing

(B) extrusion

(C) shearing and extrusion

(D) shearing and compression

82. A twist drill is a/an

(A) end cutting tool

(B) side cutting tool

(C) front cutting tool

(D) None of the above

83. The hot working of metals is carried out

(A) at the recrystallization temperature

(B) below the recrystallization temperature

(C) above the recrystallization temperature

(D) at any temperature

84. The increase in hardness due to cold working is called

(A) age hardening

(B) work hardening

(C) induction hardening

(D) flame hardening

85. Cast iron and steel pipes are produced by

(A) slush casting

(B) investment casting

(C) true centrifugal casting

(D) die casting

86. The brass and bronze are welded by _____ flame.

(A) neutral

(B) oxidizing

(C) carburizing

(D) All of the above

87. Seam welding is a/an

(A) continuous spot welding process

(B) multi-spot welding process

(C) arch welding process

(D) process used for joining round bars

88. A neutral flame in oxy-acetylene gas welding is obtained by supplying

(A) equal volume of oxygen and acetylene

(B) more volume of oxygen and less volume of acetylene

(C) more volume of acetylene and less volume of oxygen

(D) None of the above

89. Which of the following is un-conventional machining process?

(A) Grinding

(B) Milling

(C) Turning

(D) Electrochemical machining

90. Which of the following is conventional machining process?

(A) Electrochemical machining

(B) Milling

(C) Electro-discharge machining

(D) None of the above

91. In electro-discharge machining, tool is made of

(A) brass

(B) copper

(C) copper-tungsten alloy

(D) All of the above

92. Dielectric is used in

(A) electrochemical machining

(B) ultrasonic machining

(C) electro-discharge machining

(D) laser machining

93. Why is metal removal process costly?

(A) More energy is required

(B) Some of the materials is wasted

(C) Both, more energy is required and some of the materials is wasted

(D) None of the above

94. The tool material for faster machining should have

(A) wear resistance

(B) red hardness

(C) toughness

(D) All of the above

95. What is the relationship between CAD and CAM?

(A) Manufacturing and marketing

(B) Science and engineering

(C) Design and manufacturing

(D) Design and marketing

96. Why are designs periodically modified?

(A) To strive for zero-based rejection and waste

(B) To make products easier and faster to manufacture

(C) To improve product performance

(D) All of the above

97. Which of the following casting techniques has a greater impact in semiconductor industry?

(A) Single crystal

(B) Induction melting

(C) Directional solidification

(D) Conventional casting

98. Which of the following functions of production planning and control is related to the timetable of activities?

(A) Scheduling

(B) Dispatching

(C) Expediting

(D) Routing

99. Which of the following is not a popular production system?

(A) Continuous production

(B) Job order production

(C) Batch production

(D) Project production

100. Which of the following is not the system of flexible manufacturing system?

(A) Fabrication

(B) Drilling

(C) Machining

(D) Assembly

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