Sl. No.: **60002471**

ACFMCE

2014

MECHANICAL ENGINEERING

Time Allowed : 3 Hours]

[Maximum Marks : 300

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

IMPORTANT INSTRUCTIONS

1. This Booklet has a cover (this page) which should not be opened till the invigilator gives signal to open it at the commencement of the examination. As soon as the signal is received you should tear the right side of the booklet cover carefully to open the booklet. Then proceed to answer the questions.

2. This Question Booklet contains **200** questions. Prior to attempting to answer the candidates are requested to check whether all the questions are there in series without any omission and ensure there are no blank pages in the question booklet. In case any defect in the Question Paper is noticed it shall be reported to the Invigilator within first 10 minutes.

3. Answer **all** questions. **All** questions carry equal marks.

4. You must write your Register Number in the space provided on the top right side of this page. Do not write anything else on the Question Booklet.

5. An answer sheet will be supplied to you separately by the invigilator to mark the answers.

6. You will also encode your Register Number, Subject Code, Question Booklet Sl. No. etc. with Blue or Black ink Ball point pen in the space provided on the side 2 of the Answer Sheet. If you do not encode properly or fail to encode the above information, action will be taken as per commission's notification.

7. Each question comprises *four* responses (A), (B), (C) and (D). You are to select ONLY ONE correct response and mark in your Answer Sheet. In case you feel that there are more than one correct response, mark the response which you consider the best. In any case, choose ONLY ONE response for each question. Your total marks will depend on the number of correct responses marked by you in the Answer Sheet.

8. In the Answer Sheet there are **four** circles Ⓐ, Ⓑ, Ⓒ and Ⓓ against each question. To answer the questions you are to mark with Blue or Black ink Ball point pen ONLY ONE circle of your choice for each question. Select one response for each question in the Question Booklet and mark in the Answer Sheet. If you mark more than one answer for one question, the answer will be treated as wrong. *e.g.* If for any item, Ⓑ is the correct answer, you have to mark as follows :

Ⓐ ● Ⓒ Ⓓ

9. You should not remove or tear off any sheet from this Question Booklet. You are not allowed to take this Question Booklet and the Answer Sheet out of the Examination Hall during the examination. After the examination is concluded, you must hand over your Answer Sheet to the Invigilator. You are allowed to take the Question Booklet with you only after the Examination is over.

10. The sheet before the last page of the Question Booklet can be used for Rough Work.

11. Failure to comply with any of the above instructions will render you liable to such action or penalty as the Commission may decide at their discretion.

12. In all matters and in cases of doubt, the English Version is final.

13. Do not tick-mark or mark the answers in the Question booklet.

SPACE FOR ROUGH WORK

1. The force induced in the string AB due to the load 'W' as shown in Fig is
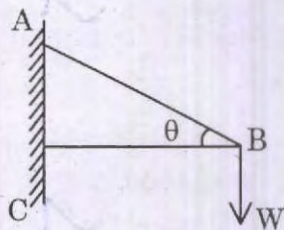
(A) $W \sin \theta$ (B) $W \cos \theta$

(C) $W \sec \theta$ (D) $W \operatorname{cosec} \theta$

2. The motion of a wheel of a car is
   (A)   Purely translation   (B)   Purely rotational
   (C)   Combined translation and rotational   (D)   None of these

3. The forces, whose lines of action are parallel to each other and act in the same direction, are known as
   (A)   Coplanar concurrent forces   (B)   Coplanar non-concurrent forces
   (C)   Like parallel forces   (D)   Unlike parallel forces

4. Moment of inertia of a circular section about its diameter (d) is
   (A) $\pi d^3 / 16$ (B) $\pi d^3 / 32$
   (C) $\pi d^4 / 32$ (D) $\pi d^4 / 64$

5. The linear velocity of a body rotating at "w" rad/sec along a circular path of radius (r) is given by
   (A) w / r (B) $w.r$
   (C) w^2 / r (D) $w^2 .r$

6. Concurrent forces are those forces whose lines of action
   (A)   Lie on the same line   (B)   Meet at one point
   (C)   Meet on the same plane   (D)   None of these

7. If I_{xx} = moment of inertia of xx axis and I_{yy} = moment of inertia about y axis, then moment of inertia about zz axis is given by
   (A) $I_{zz} = I_{xx} - I_{yy}$ (B) $I_{zz} = I_{yy} - I_{xx}$
   (C) $I_{zz} = I_{xx} + I_{yy}$ (D)   None of the above

8. The unit of area moment of inertia is
   (A) $kg - m^2$ (B) $kg - m - s^2$
   (C) kg / m^2 (D) m^4

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9. Which of the following is a scalar quantity?
   (A) Force   (B) Speed
   (C) Velocity   (D) Acceleration

10. "The algebraic sum of the moments of two forces about any point in their plane is equal to the moment of their resultant about that point". The above statement is called
    (A) Principle of motion   (B) Varignon's theorem
    (C) Lami's theorem   (D) Principle of transmissibility

11. The neutral axis of a beam
    (A) The layers are subjected to maximum bending stress
    (B) The layers are subjected to minimum bending stress
    (C) The layers are subjected to compression
    (D) The layers do not undergo any strain

12. The maximum deflection of a fixed beam carrying a central point load lies at
    (A) Fixed ends   (B) Centre of beam
    (C) $l/3$ from fixed ends   (D) None of these

13. If a composite bar is cooled, then the nature of stress in the part with high co-efficient of thermal expansion will be
    (A) Tensile   (B) Compressive
    (C) Zero   (D) None of the above

14. The Poisson's ratio for Cast Iron is
    (A) 0.13   (B) 0.23
    (C) 0.013   (D) 0.43

15. A localised compressive stress at the area of contact between two members is known as
    (A) Tensile stress   (B) Bending stress
    (C) Crushing stress   (D) Shear stress

16. The bending moment diagram for a simply supported beam loaded at centre is
    (A) a right angled triangle   (B) an isoceles triangle
    (C) an equilateral triangle   (D) a rectangle

17. In the torsion equation $\dfrac{T}{J} = \dfrac{\overline{L}}{R} = \dfrac{C\theta}{L}$, the term J/R is called

    (A) Shear modulus   (B) Section modulus
    (C) Polar modulus   (D) None of these

18. The polar modulus for a solid shaft of diameter (D) is

(A) $\dfrac{\pi D^2}{4}$

(B) $\dfrac{\pi D^3}{16}$

(C) $\dfrac{\pi D^3}{32}$

(D) $\dfrac{\pi D^4}{64}$

19. The product of Young's Modulus (E) and moment of Inertia (I) is known as
(A) Modulus of rigidity
(B) Bulk modulus
(C) Flexural rigidity
(D) Torsional rigidity

20. Factor of safety is defined as the ratio of
(A) ultimate stress to working stress
(B) working stress to ultimate stress
(C) breaking stress to ultimate stress
(D) ultimate stress to breaking stress

21. An isothermal process is also called as
(A) constant volume process
(B) constant temperature process
(C) constant pressure process
(D) none of the above

22. A perpetual motion machine of second kind violates
(A) Zeroth Law
(B) First Law
(C) Second Law
(D) Third Law

23. In humidification process the dry bulb temperature
(A) Remains constant
(B) Increases
(C) Decreases
(D) None of the above

24. The refrigerant widely used in domestic refrigerators is
(A) Carbon-dioxide
(B) Sulphur dioxide
(C) Freon-12
(D) Ammonia

25. In a vapour compression refrigeration system, the sequential order of different components is
(A) compressor, throttle valve, condenser, evaporator
(B) compressor, evaporator, throttle valve, condenser
(C) compressor, throttle valve, evaporator, condenser
(D) compressor, condenser, throttle valve, evaporator

26. During sensible cooling process
(A) DBT decreases
(B) RH increases
(C) WBT decreases
(D) All the above

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27. For the same compression ratio the efficiency of diesel cycle is
    (A) Greater than Otto cycle   (B) Less than Otto cycle
    (C) Equal to Otto cycle   (D) Not equal to Otto cycle

28. A closed system is one in which
    (A) mass fixed though energy transfer takes place
    (B) energy fixed though mass transfer takes place
    (C) neither mass nor energy transfer takes place
    (D) both mass and energy transfer takes place

29. In the polytropic process equation pv^n = constant, if n is infinitely large, the process is termed as
    (A) constant volume   (B) constant pressure
    (C) constant temperature   (D) constant entropy

30. Which law states that the internal energy of a gas is a function of temperature?
    (A) Charles' Law   (B) Joule's Law
    (C) Regnault's Law   (D) Boyle's Law

31. Which of the following quantity is not the property of the system?
    (A) pressure   (B) temperature
    (C) specific volume   (D) heat

32. All engineering processes are
    (A) quasi-static   (B) thermodynamically equilibrium
    (C) reversible   (D) irreversible

33. A perfect gas at 27°C is heated at constant pressure till its volume is double. The final temperature is
    (A) 54°C   (B) 327°C
    (C) 108°C   (D) 654°C

34. Which of the following property remains constant during throttling process?
    (A) Internal energy   (B) Pressure
    (C) Entropy   (D) Enthalpy

35. In a Carnot cycle, heat is transferred at
    (A) constant pressure   (B) constant volume
    (C) constant temperature   (D) constant enthalpy

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36. For an irreversible process,

(A) $\oint \dfrac{d\theta}{T} = 0$

(B) $\oint \dfrac{d\theta}{T} > 0$

(C) $\oint \dfrac{d\theta}{T} < 0$

(D) None of the above

37. The heat addition in dual combustion cycle is done at
    (A) constant pressure
    (B) constant volume
    (C) partly at constant pressure and partly at constant volume
    (D) constant temperature

38. One tonne of refrigeration is equivalent to
    (A) 50 kJ/min
    (B) 3.5 kW
    (C) 3000 J/min
    (D) 20 kW

39. Boiling temperature of ammonia is
    (A) −33.33°C
    (B) −78.5°C
    (C) −29.8°C
    (D) −40.7°C

40. On Psychometric chart, relative humidity lines are
    (A) horizontal
    (B) vertical
    (C) straight inclined sloping downward to the right
    (D) curved

41. Consider the following turbines
    1. Kaplan turbine
    2. Pelton wheel
    3. Francis

    The correct sequence in increasing order of the specific speeds of these turbine is
    (A) 2–3–1
    (B) 2–1–3
    (C) 3–1–2
    (D) 1–2–3

42. 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

43. Which one of the following turbine is used in underwater power stations?
    (A) Pelton turbine
    (B) Deriaz turbine
    (C) Tubular turbine
    (D) Turgo-impulse turbine

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44. In the centrifugal air compressor design practice, the value of polytropic exponent of compression is generally taken as
    (A) 1.2
    (B) 1.3
    (C) 1.4
    (D) 1.5

45. The turbo machine used to circulate refrigerant in a large refrigeration plant is
    (A) a centrifugal compressor
    (B) a radial flow turbine
    (C) an axial flow compressor
    (D) an axial flow turbine

46. If an axial flow compressor is designed for a constant velocity through all stages, then the area of annulus of the succeeding stages will
    (A) remain the same
    (B) progressively decrease
    (C) progressively increase
    (D) depend upon the number of stages

47. What will be the shape of the velocity triangle at the exit of a radial bladed centrifugal impeller, taking into account slip?
    (A) Right-angled
    (B) Isosceles
    (C) All angles less than 90°
    (D) One angle greater than 90°

48. What will happen if requirements of net positive suction head for a given pump are not satisfied?
    (A) The pump will get cavitated
    (B) The pump will consume more power
    (C) The pump will not develop head
    (D) The pump will have a low efficiency

49. Which one of the following forms of draft tube will not improve the hydraulic efficiency of the turbine?
    (A) straight cylindrical
    (B) conical type
    (C) bell-mouthed
    (D) bent tube

50. Which one of the following is the bulk modulus K of a fluid?
    (A) $\rho \dfrac{dp}{d\rho}$
    (B) $\dfrac{dp}{\rho d\rho}$
    (C) $\rho \dfrac{d\rho}{dp}$
    (D) $\dfrac{d\rho}{\rho dp}$

51. The co-efficient of friction depends on
    (A) area of contact
    (B) shape of surfaces
    (C) strength of surfaces
    (D) nature of surface

52. A fully developed laminar viscous flow through a circular tube has the ratio of maximum velocity to average velocity as

(A) 3.0   (B) 2.5

(C) 2.0   (D) 1.5

53. Flow separation at a solid surface takes place due to

(A) friction at the solid surface

(B) decrease in pressure along the flow direction

(C) increase in pressure along the flow direction

(D) positive pressure gradient along the flow direction and friction at the boundary

54. Specific speed of a pump and specific speed of a turbine is

(A) $\dfrac{N\sqrt{Q}}{H^{3/4}}$ and $\dfrac{N\sqrt{P}}{H^{5/4}}$ (B) $\dfrac{N\sqrt{Q}}{H^{3/4}}$ and $\dfrac{N\sqrt{P}}{H^{3/4}}$

(C) $\dfrac{N\sqrt{Q}}{H^{5/4}}$ and $\dfrac{N\sqrt{P}}{H^{5/4}}$ (D) $\dfrac{N\sqrt{Q}}{H^{5/4}}$ and $\dfrac{N\sqrt{P}}{H^{3/4}}$

55. Which of the following are the functions of a volute casing in a centrifugal pump?

1. To collect water from the periphery of the impeller and to transmit it to the delivery pipe at constant velocity

2. To increase the discharge of the pump

3. To increase the efficiency of the pump

4. To reduce the loss of head in discharge

(A) 1,2 and 3   (B) 2,3 and 4

(C) 1,3 and 4   (D) 1 and 2

56. High positive incidence in an axial compressor blade raw leads to

(A) suppression of separation of flow on the blade

(B) choking of the flow

(C) separation of flow on the suction side of the blade

(D) separation of flow on the pressure side of the blade

57. The stagnation pressure rise in a centrifugal compressor stage takes place

(A) only in the diffuser   (B) in the diffuser and impeller

(C) only in the impeller   (D) only in the inlet guide vanes

58. Semi-angle of a Mach cone is

(A) $\sin^{-1}\left(\dfrac{1}{\sqrt{M}}\right)$ (B) $\sin^{-1} M$

(C) $\sin^{-1}\left(\dfrac{1}{M}\right)$ (D) $\cos^{-1}\left(\dfrac{1}{M}\right)$

Where M is Mach number

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59. When a body falls freely under gravitational force, it possesses
    (A) Maximum weight
    (B) Minimum weight
    (C) No weight
    (D) No effect on its weight

60. In Rayleigh flow heating of subsonic flow causes stagnation temperature to ——— until $M < \dfrac{1}{\sqrt{r}}$ and then ———.
    (A) Increase, Constant
    (B) Decrease, Increase
    (C) Increase, Decrease
    (D) Decrease, Constant

61. The calorific value of gaseous fuels is expressed in terms of
    (A) Kcal
    (B) Kcal/kg
    (C) Kcal/m^2
    (D) Kcal/m^3

62. Indicated power of a 4-stroke engine is
    (A) $\dfrac{\text{PLAN}}{60}$
    (B) $\dfrac{2\text{PLAN}}{60}$
    (C) $\dfrac{\text{PLAN}}{2 \times 60}$
    (D) $\dfrac{4\text{PLAN}}{60}$

    Where,

    P = mean effective pressure, in $\dfrac{N}{m^2}$

    L = Stroke in m
    A = Area of Piston in m^2
    N = rpm of engine

63. Air standard Otto cycle efficiency is expressed as
    (A) $1 - \left[\dfrac{1}{r}\right]^{\frac{r-1}{r}}$
    (B) $1 - \left[\dfrac{1}{r}\right]^{\frac{r}{r-1}}$
    (C) $1 - \left[\dfrac{1}{r}\right]^{r-1}$
    (D) $1 - \left[\dfrac{1}{r}\right]^{r+1}$

    Where, r = compression ratio

64. The maximum temperature in the I.C engine cylinder is of the order of
    (A) $500 - 1000°C$
    (B) $1000 - 1500°C$
    (C) $1500 - 2000°C$
    (D) $2000 - 2500°C$

65. Combustion in compression ignition engine is
    (A) homogeneous
    (B) heterogeneous
    (C) both (A) and (B)
    (D) laminar

66. The inlet valve of a four stroke cycle I.C engine remains open for nearly
    (A) 180°
    (B) 125°
    (C) 235°
    (D) 200°

67. Most high speed compression engines operates on
    (A) Diesel cycle
    (B) Otto cycle
    (C) Dual combustion cycle
    (D) Special type of air cycle

68. The accumulation of carbon in a cylinder results in increase of
    (A) clearance volume
    (B) volumetric efficiency
    (C) ignition time
    (D) effective compression ratio

69. Diesel fuel, compared to petrol is,
    (A) less difficult to ignite
    (B) just about the same difficult to ignite
    (C) more difficult to ignite
    (D) highly ignitable

70. For maximum range of a projectile, the angle of projection should be
    (A) 30°
    (B) 45°
    (C) 60°
    (D) 90°

71. The performance of a boiler is measured by the
    (A) amount of water evaporated per hour
    (B) steam produced in kg/hr
    (C) steam produced in kg/kg of fuel burnt
    (D) all of these

72. The thermal efficiency of a diesel cycle having fixed compression ratio, with increase in cut-off ratio will
    (A) increase
    (B) decrease
    (C) be independent
    (D) none of the above

73. Proper firing order that maintains engine balancing and reduces engine vibration for a 4 cylinder engine is
    (A) 1, 2, 3, 4
    (B) 1, 2, 4, 3
    (C) 1, 4, 3, 2
    (D) None of the above

74. The air-fuel ratio of the petrol engine is controlled by
    (A) fuel pump
    (B) carburettor
    (C) injector
    (D) governor

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75. An engine indicator is used to determine the following
    (A) speed
    (B) temperature
    (C) volume of cylinder
    (D) mean effective pressure and indicated horse power

76. Engine pistons are usually made of aluminium alloy because it
    (A) is lighter   (B) wears less
    (C) absorbs shocks   (D) is stronger

77. One kg of steam sample contains 0.8 kg dry steam, it's dryness fraction is
    (A) 20%   (B) 100%
    (C) 80%   (D) 60%

78. A fusible plug is fitted in small boilers in order to
    (A) avoid excessive build up of pressure
    (B) avoid explosion
    (C) extinguish fire if water level in the boiler falls below alarming limit
    (D) control steam dome

79. The main interest of shielding in nuclear reactor is protection against
    (A) X-rays   (B) infra-red rays
    (C) neutrons and gamma rays   (D) α, β and γ rays

80. In triggering fission, which type of neutrons are more effective
    (A) fast   (B) slow
    (C) in bulk   (D) static

81. Consider the following statements :
    Across the normal shock, the fluid properties change in such a manner that the
    1. velocity of flow is subsonic   2. pressure increases
    3. specific volume decreases   4. temperature decreases
    Of these statements :
    (A) 2,3 and 4 are correct   (B) 1,2 and 4 are correct
    (C) 1,3 and 4 are correct   (D) 1,2 and 3 are correct

82. In a flow through a convergent nozzle, the ratio of back pressure to the inlet pressure is given by the relation $\frac{P_B}{P_1} = \left[\frac{2}{r+1}\right]^{r/r+1}$. If the back pressure is lower than P_B given by the above equation, then

(A)   the flow in the nozzle is supersonic

(B)   a shock wave exists inside the nozzle

(C)   the gases expand outside the nozzle and a shock wave appears outside the nozzle

(D)   a shock wave appears at the nozzle exit

83. Consider the following statements :

A convergent-divergent nozzle is said to be chocked when

1.   Critical pressure is attained at the throat

2.   Velocity at the throat becomes sonic

3.   Exit velocity becomes supersonic

Of these statements

(A)   1,2 and 3 are correct   (B)   1 and 2 are correct

(C)   2 and 3 are correct   (D)   1 and 3 are correct

84. Consider the following statements pertaining to isentropic flow :

1.   To obtain stagnation enthalpy, the flow need not be decelerated isentropically but should be decelerated ediabatically

2.   The effect of friction in an adiabatic flow is to reduce the stagnation pressure and increase entropy

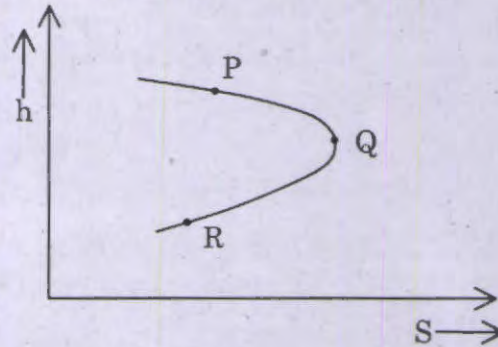3.   A constant area tube with rough surfaces can be used as a subsonic nozzle

Of these statements

(A)   1,2 and 3 are correct   (B)   1 and 2 are correct

(C)   1 and 3 are correct   (D)   2 and 3 are correct

85. Given r = ratio of specific heats, for Rayleigh line, the temperature is maximum at a mach number of

(A) $\frac{1}{\sqrt{r}}$ (B) $\sqrt{r}$

(C) $\frac{1}{r}$ (D) r

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86. In a Fanno line shown in the given figure

    (A)   subsonic flow proceeds along PQR

    (B)   supersonic flow proceeds along PQR

    (C)   subsonic flow proceeds along PQ and supersonic flow proceeds along RQ

    (D)   subsonic flow proceeds along RQ and supersonic flow proceeds along PQ

87. Introduction of a pitot tube in a supersonic flow would produce

    (A)   normal shock at the tube nose

    (B)   curved shock at a little distance upstream of the tube nose

    (C)   normal shock at the upstream of the tube nose

    (D)   curved shock at the upstream of the tube nose

88. Which of the following statements are correct?

    1.   Mach wave is a very weak shock wave

    2.   Entropy change across a shock wave is nearly zero

    3.   Total pressure behind a shock wave is less than ahead of it

    4.   Mach number behind a normal shock is less than one

    Codes :

    (A)   1,2 and 3   (B)   1,3 and 4

    (C)   1,2 and 4   (D)   2,3 and 4

89. For minimum work in compressor operating between limits p_1 and p_3 the best intercooler pressure p_2 is given by

    (A) $p_2 = \sqrt{p_1 + p_3}$ (B) $p_2 = \sqrt{p_1 p_3}$

    (C) $p_2 = \dfrac{p_1 + p_3}{2}$ (D) $p_2 = p_1 - p_3$

90. For one-dimensional isentropic flow in a diverging passage, if the initial static pressure is P_1 and the initial mach number is $M_1 (M_1 < 1)$, then for the downstream flow

    (A) $M_2 < M_1 ; P_2 < P_1$ (B) $M_2 < M_1 ; P_2 > P_1$

    (C) $M_2 > M_1 ; P_2 > P_1$ (D) $M_2 > M_1 ; P_2 < P_1$

91. If the velocity of propagation of small disturbances in air at 27°c is 330 m/s then at a temperature of 54°c, its speed would be

(A) 660 m/s

(B) $330 \times \sqrt{2}$ m/s

(C) $330 / \sqrt{2}$ m/s

(D) $330 \times \sqrt{\dfrac{327}{300}}$ m/s

92. The overall efficiency of a rocket is maximum when aircraft velocity compared to jet velocity is

(A) same

(B) half

(C) double

(D) two third

93. In rocket propulsion system, specific impulse is given by

(A) Thrust per unit volume flow rate of propellant

(B) Thrust per unit area

(C) Thrust per unit weight flow rate of propellant

(D) Thrust per unit time

94. A rocket engine for the combustion of its fuel

(A) Carries its own oxygen

(B) Uses surrounding air

(C) Uses compressed atmospheric air

(D) Does not require oxygen

95. Propulsive efficiency is defined as ratio of

(A) Thrust power and fuel energy

(B) Propulsive power and engine output

(C) Propulsive power and fuel input

(D) Thrust power and propulsive power

96. Turbo propeller has the following additional feature over turbojet

(A) Propeller

(B) Diffuser

(C) Intercooler

(D) Turbine and combustion chamber

97. The efficiency of propulsion of a jet engine is equal to

(A) $\dfrac{2u}{v-u}$

(B) $\dfrac{2u}{v+u}$

(C) $\dfrac{v-u}{2u}$

(D) $\dfrac{v+u}{2u}$

Where, v = relative velocity of jet to aircraft

u = velocity of aircraft

98. In jet engines, for the efficient production of large power, fuel is burnt in an atmosphere of

(A) Vacuum

(B) Atmospheric air

(C) Compressed air

(D) Oxygen alone

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99. A gas turbine used in air craft should be
    (A) high h.p and low weight
    (B) low weight and small frontal area
    (C) small frontal area and high h.p
    (D) high speed and high h.p

100. A jet engine works on the principle of conservation of
    (A) mass
    (B) energy
    (C) flow
    (D) linear momentum

101. The maximum fluctuation of energy in a flywheel is equal to
    (A) $I.w (w_1 - w_2)$
    (B) $I w^2 C_s$
    (C) $2EC_s$
    (D) All of the above

102. The relation between the pitch of the chain (p) and pitch circle diameter of the sprocket (d) is given by
    (A) $p = d \sin\left(\dfrac{60^\circ}{T}\right)$
    (B) $p = d \sin\left(\dfrac{90^\circ}{T}\right)$
    (C) $p = d \sin\left(\dfrac{120^\circ}{T}\right)$
    (D) $p = d \sin\left(\dfrac{180^\circ}{T}\right)$

    Where T = Number of teeth on the sprocket

103. The engine of an aeroplane rotates in clockwise direction when seen from the tail end and the aeroplane takes a turn to the left. The effect of the gyroscopic couple on the aeroplane will be
    (A) To raise the nose and dip the tail
    (B) To dip the nose and raise the tail
    (C) To raise the nose and tail
    (D) To dip the nose and tail

104. The most common semi – cone angle of a cone clutch is
    (A) 5°
    (B) 7.5°
    (C) 12.5°
    (D) 17.5°

105. The factor which affects the critical speed of a shaft is
    (A) Diameter of the disc
    (B) Span of the shaft
    (C) Eccentricity
    (D) All of the above

106. A less viscous lubricant is good protection against
    (A) Surface pitting
    (B) Normal wear
    (C) Abrasion
    (D) Local welding

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107. Match List I with List II and select the correct answer using the codes given below the lists :

List I | List II
(a) Flywheel | 1. Dunkerley method
(b) Governor | 2. Turning moment
(c) Critical speed | 3. D' Alempbert's Principle
(d) Inertia force | 4. Speed control on par with load

Codes :

	(a)	(b)	(c)	(d)
(A)	4	2	3	1
(B)	4	2	1	3
(C)	2	4	3	1
(D)	2	4	1	3

108. Match List I with List II and select the correct answer using the codes given below the lists :

List I | List II
(a) 4 links, 4 turning pairs | 1. Complete constraint
(b) 3 links, 3 turning pairs | 2. Successful constraint
(c) 5 links, 5 turning pairs | 3. Rigid frame
(d) Footstep bearning | 4. Incomplete constraint

Codes :

	(a)	(b)	(c)	(d)
(A)	3	1	4	2
(B)	1	3	2	4
(C)	3	1	2	4
(D)	1	3	4	2

109. Match List I (Applications) with List II (Features of vibration) and select the correct answer using the codes given below the lists :

List I | List II
(a) Vibration damper | 1. Frequency of free vibration
(b) Shock absorber | 2. Forced vibration
(c) Frahm tachometer | 3. Damping of vibration
(d) Oscillator | 4. Transverse vibration
 | 5. Absorption of vibration

Codes :

	(a)	(b)	(c)	(d)
(A)	5	3	2	1
(B)	3	1	4	2
(C)	5	3	4	1
(D)	3	4	2	5

110. A system of masses rotating in different parallel planes is in dynamic balance if the resultant

(A) Force is equal to zero

(B) Couple is equal to zero

(C) Force and resultant couple are both equal to zero

(D) Force is numerically equal to the resultant couple, but neither of them need necessary be zero

111. In case of involute tooth profile choose the correct statement

(A) Interference does not occur for any number of pinion teeth

(B) Pressure angle is constant

(C) The teeth are difficult to manufacture

(D) The teeth are stronger than cycloidal teeth

112. The primary unbalanced force of a reciprocating engine is maximum when crank is inclined to line of stroke at

(A) $0°$ (B) $180°$

(C) $0°$ Or $180°$ (D) $90°$

113. Which of the following is a lower pair?

(A) Ball and socket   (B) Piston and cylinder

(C) Cam and follower   (D) (A) and (B) above

114. A mechanism is an assemblage of

(A) Two Links   (B) Three links

(C) Four links or more than four links   (D) All of the above

115. A slider crank chain consists of following numbers of turning and sliding pairs

(A) 1, 3   (B) 2, 2

(C) 4, 0   (D) 3, 1

116. 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

117. The power transmitted by a belt is maximum when the maximum tension in the belt (T) is equal to

(A) T_C (B) $2T_C$

(C) $3T_C$ (D) $4T_C$

118. Due to slip of the belt, the velocity ratio of the belt drive
    (A) Increases   (B) Decreases
    (C) Becomes zero   (D) Does not change

119. To reduce speed fluctuation during a cycle of operation in an engine the device used is
    (A) Governor   (B) Governor and flywheel
    (C) Gyroscope   (D) Flywheel

120. In a forced vibration with viscous damping, maximum amplitude occurs when forced frequency is
    (A) Equal to natural frequency   (B) Slightly less than natural frequency
    (C) Slightly greater than natural frequency (D) Zero

121. Match List I (Applications) with List II (Drive element) and select the correct answer using the codes given below the lists :

        List I   List II
    (a) Automobile differential   1. Flat belt
    (b) Bicycle   2. V - belt
    (c) Planning machine   3. Chain drive
    (d) Radiator fan of automobile   4. Gear drive

        (a)   (b)   (c)   (d)
    (A) 4   3   1   2
    (B) 1   3   4   2
    (C) 4   2   1   3
    (D) 1   2   4   3

122. Pivoted segment thrust bearing is used in order to provide
    (A) Uniform distribution of load   (B) Uniform wear
    (C) A converging film of oil   (D) Easy flow of oil

123. In a horizontal flat belt drive, it is customary to use
    (A) Bottom side of the belt as the slack side during the transmission of power
    (B) Top side of the belt as the slack side
    (C) Crossed - belting
    (D) Idler in between

124. Which of the following is called the divided journal bearings?
    (A) Bell and roller bearings   (B) Pivot bearing
    (C) Split carbon bearing   (D) Plummer block

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125. Consider the following statements

The form factor of a spur gear tooth depends upon the

1. Number of teeth
2. Pressure angle
3. Addendum modification coefficient
4. Circular pitch

Of these statement

- (A) 1 and 3 are correct
- (B) 2 and 4 are correct
- (C) 1,2 and 3 are correct
- (D) 1 and 4 are correct

126. Select the method of representing an object in geometric modelling

- (A) Wire frame modelling
- (B) Surface modelling
- (C) Solid modelling
- (D) All the above

127. For a journal running in a bearing clockwise, at steady state, the minimum clearance shall be

- (A) Along the load line
- (B) To the left of the load line
- (C) To the right of the load line
- (D) Unpreditable

128. Which coupling out of the following provides Kinematic flexibility?

- (A) Muff coupling
- (B) Oldham coupling
- (C) Slip coupling
- (D) Flange coupling

129. Match List I with List II and select the correct answer using the codes given below the lists :

List I	List II
(a) RAM	1. Network of computers
(b) ROM	2. Software which makes the computer work
(c) DOS	3. Memory used for processing
(d) LAN	4. Memory in which user can not write anything

Codes :

	(a)	(b)	(c)	(d)
(A)	1	2	3	4
(B)	3	4	2	1
(C)	2	3	4	1
(D)	3	4	1	2

130. Match List I (Machine element) with List II (Cause of failure) and select the correct answer using the codes given below the lists :

	List I		List II
(a)	Axle	1.	Shear stress
(b)	Cotter	2.	Tensile / compressive stress
(c)	Connecting rod	3.	Wear
(d)	Journal bearing	4.	Bending stress

Codes :

	(a)	(b)	(c)	(d)
(A)	4	1	2	3
(B)	1	4	2	3
(C)	4	1	3	2
(D)	1	4	3	2

131. The buckling load will be maximum for a column if
(A) One end of the column is clamped and the other end is free
(B) Both ends of the column are clamped
(C) Both ends of the column are hinged
(D) One end of the column is hinged and the other end is free

132. Correlate statement I and II using code given below
I. The probability of seizure in worm on worm wheel drives are reduced by making worm wheel teeth in bronze
II. Steel on bronze has low coefficient of friction than steel on steel or steel on C. I .
Code :
(A) I and II are correct and II explains I
(B) I and II are independently correct
(C) I is correct but II is not
(D) II is correct but I is not

133. A helical gear and a straight tooth spur gear are designed to transmit same power with same driving speed and velocity ratio
Choose the wrong statement
(A) Helical gear will have smaller pitch circle diameter
(B) Helical gear will have smaller module
(C) Helical gear will have smaller length of tooth
(D) Helical gear teeth will be subjected to lesser bending stress

134. Correlate the following statements
I. V – belt has the advantage of small centre distance but under limiting conditions the small centre distance results in small belt length which is a disadvantage
II. A small belt length will cause the belt to go through a large number of stress reversal in a given time
Codes :
(A) Both I and II are correct and II explains I
(B) I and II are independently correct
(C) I is correct but II is not
(D) II is correct but I is not

135. The ratio of strength of butt welds under impact loads to gradual loads is
    (A) 0.5   (B) 0.6
    (C) 0.7   (D) 2

136. Match the following
    (a) Automobiles   1. Fluid coupling
    (b) Hydraulic machinery   2. Oldham coupling
    (c) Workshops   3. Hooke's coupling
    (d) Misaligned shafts   4. Protected flange coupling

        (a)   (b)   (c)   (d)
    (A) 1   3   2   4
    (B) 2   4   3   1
    (C) 3   1   4   2
    (D) 4   2   1   3

137. Select the correct one from the following for a crown gear
    (A) Cutting angle is 90°
    (B) Pitch cone angle is 90°
    (C) Tip angle is 90°
    (D) Cone angle is 90°

138. Choose the correct statement
    (A) The contact in case of spur gears is a line
    (B) The contact in case of spur gears is a point
    (C) The noise in helical gears is more as compared to spur gears
    (D) The contact in case of helical gears remains a line throughout

139. The materials having same elastic properties in all directions are called
    (A) Ideal materials
    (B) Uniform materials
    (C) Isotropic materials
    (D) elastic materials

140. In a leaf spring, the minimum number of full length leaves should be
    (A) 2   (B) 3
    (C) 4   (D) 1

141. The point of contra flexure in a loaded beam refers to the section where the
    (A) Shear force is zero   (B) Bending moment is maximum
    (C) Shear force is maximum   (D) Bending moment changes the sign

142. Match List I with II and select the correct answer

    List I   List II
    (a) Helical gears   1. Non - interchangeable
    (b) Herring bone gears   2. Zero axial thrust
    (c) Worm gears   3. Quiet motion
    (d) Hypoid gears   4. Extreme speed reduction
    Codes :

           (a)   (b)   (c)   (d)
    (A)   1   2   3   4
    (B)   3   2   1   4
    (C)   3   1   4   2
    (D)   3   2   4   1

143. Which one is not the advantage of helical gear?
    (A) Gradual contact of teeth   (B) High contact ratio
    (C) Axial force component   (D) High peripheral speed

144. Internal gears can be made by
    (A) Hobbing   (B) Shaping with Pinion cutter
    (C) Shaping with rack cutter   (D) Milling

145. Consider the following components
    1. A dedicated computer
    2. Bulk memory
    3. Telecommunication lines
    Which of these components are required for a DNC system?
    (A) 2 and 3   (B) 1 and 2
    (C) 1,2 and 3   (D) 1 and 3

146. Consider the following tool materials
    1. High carbon steel tools
    2. High speed steel tools
    3. Ceramic tools
    4. Carbide tools
    Which of these tools are provided with negative rake angle?
    (A) 1 and 2   (B) 2 and 3
    (C) 1 and 3   (D) 3 and 4

147. Scab is a
    (A) Sand casting defect
    (B) Machining defect
    (C) Welding defect
    (D) Forging defect

148. Which one of the following materials will require the largest size of riser for the same size of casting?
    (A) Aluminium
    (B) Cast Iron
    (C) Steel
    (D) Copper

149. Consider the following statements about nose radius
    1. It improves tool life
    2. It reduces the cutting force
    3. It improves the surface finish
    Of these statements
    (A) 1 and 2 are correct
    (B) 2 and 3 are correct
    (C) 1 and 3 are correct
    (D) 1, 2 and 3 are correct

150. Enlarging an existing circular hole with a rotating single point tool is called
    (A) Boring
    (B) Drilling
    (C) Reaming
    (D) Internal turning

151. In blanking operation the clearance provided is
    (A) 50% on punch and 50% on die
    (B) On die
    (C) On punch
    (D) On die or punch depending upon designers choice

152. A diamond locating pin is used in jigs and fixtures because
    (A) Diamond is very hard and wear resistant
    (B) It occupies very little space
    (C) It helps in assembly with tolerance on centre distance
    (D) It has a long life

153. Guide ways of Lathe beds are hardened by
    (A) Carburising
    (B) Cyaniding
    (C) Nitriding
    (D) Flame hardening

154. Feed drives in CNC milling machines are provided by
   (A) Synchronous motors   (B) Induction motors
   (C) Stepper motors   (D) Servo motors

155. Consider the following operations
   1. Under cutting
   2. Plain turning
   3. Taper turning
   4. Thread cutting
   The correct sequence of these operations in machining a product is
   (A) 2 – 3 – 4 – 1   (B) 3 – 2 – 4 – 1
   (C) 2 – 3 – 1 – 4   (D) 3 – 2 – 1 – 4

156. Which of the following is / are the advantages of numerical control of machine tools?
   1. Reduced lead time
   2. Consistently good quality
   3. Elaborate fixtures are not required
   (A) 2 and 3   (B) 1 and 2
   (C) 1 alone   (D) 1 and 3

157. Which one of the following material is used as the bonding material for grinding wheels?
   (A) Silicon carbide   (B) Sodium silicate
   (C) Boron carbide   (D) Aluminium oxide

158. In a mechanical shaper, the length of stroke is increased by
   (A) Increasing the centre distance of bull gear and crank pin
   (B) Decreasing the centre distance of bull gear and crank pin
   (C) Increasing the length of the ram
   (D) Decreasing the length of the slot in the slotted lever

159. Directional solidification in castings can be improved by using
   (A) Chills and chaplets   (B) Chills and padding
   (C) Chaplets and padding   (D) Chills, Chaplets and padding

160. Which one of the following pairs is not correctly matched?
   (A) Aluminium alloy piston - Pressure Die Casting
   (B) Jewellery - Wave Process
   (C) Large Pipes - Centrifugal Casting
   (D) Large bells - Loam moulding

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161. If the melting ratio of a cupola is 10:1, then the coke requirement for one ton melt will be
   (A)   0.1 ton   (B)   10 tons
   (C)   01 ton   (D)   11 tons

162. Match List I with List II and select the correct answer using the codes given below the lists :

   List I (Wear type)   List II (Associated mechanism)
   (a)   Abrasive wear   1.   Galvanic action
   (b)   Adhesive wear   2.   Ploughing action
   (c)   Electrolytic wear   3.   Molecular transfer
   (d)   Diffusion wear   4.   Plastic deformation
                                    5.   Metallic bond

	(a)	(b)	(c)	(d)
(A)	2	5	1	3
(B)	5	2	1	3
(C)	2	1	3	4
(D)	5	2	3	4

163. In manual part programming and tape preparation for a NC drilling machine, the spindle speed was coded as S684. The spindle speed in rpm will be
   (A)   684   (B)   68.4
   (C)   840   (D)   6840

164. Accuracy of measuring equipment is
   (A)   The closeness with which a measurement can be read directly from a measuring instruments
   (B)   A measuring of how close the reading is to the true size
   (C)   The difference between measured value and actual value
   (D)   The smallest change in measure and that can be measured

165. For the measurement of which of the following is McLeod gauge used
   (A)   Low pressure   (B)   High pressure
   (C)   High temperature   (D)   Low temperature

166. Systematic errors are
   (A)   Randomly distributed
   (B)   Regularly repetitive in nature
   (C)   Distributed on both +Ve and −Ve sides of mean value
   (D)   Unknown errors

167. The value of modulus of elasticity for mild steel is of the order of

(A) 2.1×10^5 kg/cm^2

(B) 2.1×10^6 kg/cm^2

(C) 0.1×10^6 kg/cm^2

(D) 3.8×10^6 kg/cm^2

168. Which of the following are measure by a sine bar?

(A) Gear profiles   (B) External tapers

(C) Internal tapers   (D) Surface roughness

169. The thread micrometer measures

(A) The major diameter of the thread   (B) The minor diameter of the thread

(C) The effective diameter of the thread   (D) The root diameter of the thread

170. Repeatability of measuring equipment is

(A) The closeness with which a measurement can be read directly from a measuring instrument

(B) A measure of how close the reading is the true size

(C) Difference between measured value and actual value

(D) The capability if indicate the same reading again and again

171. The number of slip gauge in a metric unit set are

(A) 103   (B) 76

(C) 48 and 31   (D) all of the above sets are available

172. Gear tooth caliper is used to find the chordal thickness of the following type of gear tooth

(A) Spur gear   (B) Helical gear

(C) Worm gear   (D) Bevel gear

173. Circular scale of the micrometer is marked on

(A) Anvil   (B) Barrel

(C) Thimble   (D) Ratchet

174. Fiducial indicator contains

(A) Calibrated scale   (B) A single index mark

(C) Micrometer screw movement   (D) Optical head

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175. A comparator for its working depends on
   (A) Accurately calibrated scale
   (B) Comparison with standard such as slip gauges
   (C) Accurate micrometer gauge
   (D) Optical devices

176. The thickness of oil film at the surface of slip gauges is of the order of
   (A) 0.005 micron
   (B) 0.1 micron
   (C) 1 micron
   (D) 10 microns

177. The two slip gauges in precision measurement are joined by
   (A) Assembling
   (B) Sliding
   (C) Adhesion
   (D) Wringing

178. Wickman gauge is used for inspection of
   (A) Holes
   (B) Shafts
   (C) Gears
   (D) Screw threads

179. According to Taylor's principle, 'No Go' gauge checks
   (A) Only one features at a time
   (B) Only important dimensions at a time
   (C) All the dimensions at a time
   (D) Only the related dimensions at a time

180. A plug gauge is used for measuring
   (A) Cylinder
   (B) Cylindrical bores
   (C) Spherical holes
   (D) Screw threads

181. Gear tooth vernier is used to measure
   (A) Gear tooth profile
   (B) Gear tooth thickness
   (C) Pitch line thickness of gear tooth
   (D) Addendum and dedendum

182. The surface roughness on a drawing is represented by
   (A) Circles
   (B) Squares
   (C) Triangles
   (D) Curves

183. Addendum of a gear is equal to
   (A) Pitch p
   (B) $0.3\ p$
   (C) $0.3183\ p$
   (D) $0.3683\ p$

184. Lines need to be balanced in
    (A) Product layout
    (B) Process layout
    (C) Functional layout
    (D) Fixed position layout

185. Unity of command is violated under ————— organization.
    (A) Line
    (B) Line and staff organization
    (C) Functional
    (D) Line as well as functional

186. Templates are used for
    (A) Advancing a programme in automatic machines
    (B) Planning layout
    (C) Material flow optimization
    (D) Checking the reliability of a product

187. A compact estimate of the handling which must be done between various work stations is obtained from
    (A) Gantt chart
    (B) String diagram
    (C) Travel chart
    (D) Bar chart

188. Material handling is higher in case of
    (A) Process layout
    (B) Product layout
    (C) Group layout
    (D) Fixed position layout

189. ABC analysis is used in
    (A) Job analysis
    (B) Production schedule
    (C) Inventory control
    (D) Simulation

190. Bin cards are used in keeping record of
    (A) Man power
    (B) Machine utilization
    (C) Material storage
    (D) Entry / Exit time of workers

191. Two bin system is concerned with
    (A) Forecasting sales
    (B) Storage system
    (C) Economizing expenditure
    (D) Ordering procedure

192. MAPI (Machinery Allied Product Institute) method guides for action on the subject of
    (A) Quality control
    (B) Material management
    (C) Equipment replacement
    (D) Optimum utilization of machines

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193. Therbligs, in micromotion study, is described by
   (A) An event
   (B) Standard symbol and colour
   (C) An activity
   (D) None of the above

194. Merit rating is the method of determining
   (A) Worth of a machine
   (B) Worker's performance on a job
   (C) Relative value of job
   (D) Utility of a product

195. Job evaluation is the method of determining
   (A) Utility of a product
   (B) Worth of as machine to perform a specified task
   (C) Relative value of a job
   (D) Worker's performance on a job

196. Gantt charts are associated with
   (A) Material handling
   (B) Inventory control
   (C) Production schedule
   (D) Sales forecast

197. Routing and scheduling are integral part of
   (A) Product planning
   (B) Work study
   (C) Job analysis
   (D) Quality control

198. A CPM network is
   (A) Activity oriented
   (B) Event oriented
   (C) Both activity and event oriented
   (D) Neither activity nor event oriented

199. In PERT, the time estimates of activities are probabilistic and the probability of their occurrence follows
   (A) Binomial distribution
   (B) β - distribution
   (C) Normal distribution
   (D) Poisson's distribution

200. CPM considers the trade between cost and
   (A) Man power
   (B) Time
   (C) Machines
   (D) Material