1. If a voltmeter is connected in series to a load (like an ammeter), what will happen ?
   (A) the meter will burn.
   (B) the load will burn.
   (C) voltage measurement will be too high.
   (D) there will be negligible current in the circuit.

2. A 250 kVA, 11000 V/400 V, 50 Hz single phase transformer has 80 turns on the low voltage side. The full load current and number of turns of the high voltage side current are
   (A) 28 A and 160 turns
   (B) 12.8 A and 2000 turns
   (C) 22.7 A and 2200 turns
   (D) 1225 A and 80 turns

3. A 4-pole wave connected DC machine armature has 612 conductors, flux per pole 25 mWb and is driven at 900 rpm. The generated emf is
   (A) 58 V
   (B) 128 V
   (C) 312 V
   (D) 459 V

4. A separately excited DC motor runs at 900 rpm when connected to a 460 V supply. The speed of the motor, when the machine is connected to 200 V supply with new flux be 70% of the original flux, will be
   (A) 1007 rpm
   (B) 559 rpm
   (C) 428 rpm
   (D) 226 rpm

5. The armature of a DC motor has resistance of 0.1 ohm and is connected to a 250 V supply. The generated emf when the motor is taking 60 A will be
   (A) 244 V
   (B) 250 V
   (C) 256 V
   (D) 280 V

6. A three point starter for DC motor is used
   (A) only to limit the initial current
   (B) both for limiting current at initial stage and protection of the motor
   (C) only to have a smooth running of the motor
   (D) only to control the back emf of the machine

**Space for Rough Work**

7. A resistance of 7 ohm is connected in series with a pure inductance of 31.8 mH and the circuit is connected to a 100 V, 50 Hz sinusoidal supply. The circuit current will be
   (A) 42.7 A
   (B) 32.8 A
   (C) 20.1 A
   (D) 8.2 A

8. If a circuit contains both resistance and capacitance in series, which one of the following is correct.
   (A) The current lags the voltage by less than 90°
   (B) The current lags the capacitor voltage by 90°
   (C) The voltage lags the current by less than 90°
   (D) The voltage leads the current by less than 90°

9. Associated with reactive power, which one from following is correct ?
   (A) Average of such power over a cycle is a non zero value.
   (B) Corresponding energy is unidirectional.
   (C) Corresponding energy continuously flows into and back out from the reactive component.
   (D) Corresponding unit is kVA.

10. Two currents in a parallel circuit are $I_1 = 100 \angle -22°$ A and $I_2 = 100 \angle 158°$ A. The combined RMS current drawn is
   (A) 200 A
   (B) 0 A
   (C) 100 A
   (D) 50 A

11. A three phase induction motor is wound for 4 poles and is supplied from a 400 V, 50 Hz source. The synchronous speed for the machine is
   (A) 3000 rpm
   (B) 1500 rpm
   (C) 750 rpm
   (D) 500 rpm

12. A moving coil instrument gives full scale deflection with 15 mA and has a resistance of 5 ohm. The resistance required in series to enable it to read up to 10 V is
   (A) 1567.3 ohm
   (B) 1241.3 ohm
   (C) 691.7 ohm
   (D) 661.7 ohm

**Space for Rough Work**

13. Permanent magnet moving coil instrument is used directly for measurement of
(A) DC current or voltage
(B) AC current or voltage
(C) both AC and DC current or voltage
(D) AC power

14. An 1 mA ammeter has a resistance of 100 ohms. It is to be converted to a 1 A ammeter. The value of shunt resistance is
(A) 100 ohms
(B) 1000 ohms
(C) 0.0011 ohm
(D) 0.1001 ohm

15. For a dynamometer instrument while applying to a single phase circuit, which of the following is not correct ?
(A) Can only read leading power factor.
(B) Can be used as voltmeter.
(C) Can be used as watttmeter.
(D) Possesses uniform scale while measuring power.

16. Which of the following statement is correct ?
(A) Hydro–generation based plant has less running cost than coal based thermal plant.
(B) Generation from hydro plant does not depend on water head.
(C) Thermal plant uses steam as the fuel.
(D) Nuclear plant does not use steam.

17. The magnetizing current drawn by the induction motor results in its power factor to be
(A) zero
(B) unity
(C) lagging
(D) leading

18. In 3 phase induction motor, lamination is
(A) not provided in the cores
(B) provided only in stator core
(C) provided only in rotor core
(D) provided both in rotor and stator cores

**Space for Rough Work**

19. A resistor of 1 ohm is connected in series with an inductor of 1 ohm, the angle between the current and voltage across the combination will be
(A) 90°
(B) 45°
(C) 36.6°
(D) 0°

20. Two resistances are connected in parallel and the combination draws 5 A from the supply. If through one resistance of 10 ohm, 2 A flows what is the value of the other resistance ?
(A) 8 ohm
(B) 12 ohm
(C) 15.34 ohm
(D) 6.67 ohm

21. Two resistances are connected in series through which 5 A current is flowing. A moving iron instrument measures 100 V across the combination. If one resistance is of 10 ohm, then what is the value of the other resistance ?
(A) 10 ohm
(B) 20 ohm
(C) 5 ohm
(D) 1 ohm

22. At 50 Hz, inductor of 1 ohm and a capacitor of 1 ohm are connected in series and 10 A is flowing through them. The voltage measured across the combination by a moving iron instrument will be
(A) 10 V
(B) 20 V
(C) 1 V
(D) 0 V

23. In a lead acid battery, when a large load is connected across its terminals (Select the correct statement.)
(A) the battery terminal voltage falls
(B) the battery terminal voltage rises
(C) the battery terminal voltage does not change
(D) the delivered power by battery remains same as before

**Space for Rough Work**

24. A current 3 A flows through a 10 ohm resistor. The energy dissipated in 5 minutes will be
(A) 2000 J
(B) 2700 J
(C) 90 W
(D) 450 J

25. 50V, 60 Hz supply is connected to an impedance of 6 + j 11.31 ohm. The apparent power associated with the impedance is
(A) 54.8 W
(B) 102.4 VA
(C) 195.2 VA
(D) 92.5 W

26. An alternating sinusoidal current waveform has RMS value of 10 A. Its peak values over one cycle are
(A) 14.14 A both
(B) 14.14 A and –14.14 A
(C) –14.14 both
(D) 10 A and –10 A

27. Two resistances are in parallel. If in one of them, the power dissipated is 20 W and current is 2 A. What is the current flowing in the other resistance of 20 ohm.
(A) 1 A
(B) 0.2 A
(C) 0.5 A
(D) 5 A

28. A voltage wave is expressed by V = 50 + 30 sin 314t (V). The RMS value of the wave is
(A) 80 V
(B) 67.2 V
(C) 54.3 V
(D) 71.4 V

29. The turbine generator consists of a series of steam turbines interconnected to each other and a generator on a common shaft.
For a thermal power plant, which of the followings is correct ?
(A) Turbines and generator are not mechanically coupled.
(B) A series of turbines are connected through a common shaft to the generator.
(C) Generator and turbine are electrically connected.
(D) Generator provides power to the turbine.

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**Space for Rough Work**

30. When a resistance is connected in series to a coil which of the following statements is correct ?

(A) The phase difference between supply voltage and current increases compared to only coil case

(B) The phase difference between supply voltage and current decreases compared to only coil case

(C) The phase difference between voltage across coil and its current increases

(D) The phase difference between voltage across coil and its current decreases

31. Which inductance will give the same value of reactance magnitude as a 1 micro–farad capacitor with both at 50 Hz ?

(A) 1.4 H

(B) 3.2 H

(C) 5.6 H

(D) 10.1 H

32. A current of 40 cos (314 t – $\pi$/8) A is drawn from a supply voltage of 500 cos (314 t + $\pi$/8) V. The power supplied is

(A) 1000 W

(B) 2000 W

(C) 1000/$\sqrt{2}$ W

(D) 2000/$\sqrt{2}$ W

33. At a frequency less than the resonant frequency,

(A) series RLC circuit is capacitive and parallel RLC circuit is inductive

(B) series RLC circuit is inductive and parallel RLC circuit is capacitive

(C) both RLC circuits are inductive

(D) both RLC circuits are capacitive

34. In a series RLC circuit, the ac voltage across the capacitor and resistor are 60 V and 80 V respectively. An AC voltmeter measuring voltage across the combination will read

(A) 140 V

(B) 40 V

(C) 20 V

(D) 100 V

**Space for Rough Work**

35. After connecting a capacitor in parallel to a single phase load, which quantity of the following does not change ?
(A) Reactive power drawn from the supply terminals.
(B) Current drawn from the supply terminals.
(C) Real power drawn from the supply terminals.
(D) Power factor angle at the supply terminals.

36. A transformer has 200 W as iron loss at full load. The iron loss at half full load will be
(A) 50 W
(B) 100 W
(C) 400 W
(D) 200 W.

37. The voltage per turn of the primary of a single phase transformer is .....the voltage per turn of the secondary.
(A) more than
(B) less than
(C) same as
(D) none of the above

38. At every instant the direction of secondary current in a transformer must be such as to oppose any change in flux. This is in accordance with
(A) Faraday's law
(B) Joule's law
(C) Lenz's law
(D) Coulomb's law

39. The rotor of three phase induction motor
(A) always rotates in the direction of stator field
(B) always rotates in the direction opposite to stator field
(C) rotates with higher speed than the stator field
(D) none of the above.

40. A DC shunt generator delivers 395 A at 250 V and the resistance of the shunt field and armature are 50 ohm and 0.05 ohm respectively. The generator emf will be
(A) 120 V
(B) 220 V
(C) 260 V
(D) 270V

**Space for Rough Work**

41. For what values of k the following system of equations

$x + ky + 3z = 0$; $3x + ky - 2z = 0$; $2x + 3y - 4z = 0$ possess a non–trivial solution over the set of rationals ?

(A) $\frac{3}{2}$

(B) $\frac{33}{2}$

(C) 33

(D) $\frac{31}{2}$

42. If A is a $3 \times 3$ Skew–symmetric matrix, then trace of A is

(A) $-1$

(B) 1

(C) 2

(D) 0

43. If A is an orthogonal matrix, then $A^{-1}$ is

(A) $A^T$

(B) A

(C) $A^2$

(D) 2A

**Space for Rough Work**

44. If $4x + i(3x - y) = 3 - 6i$, where $x$ , y are real numbers and $i = \sqrt{-1}$, then the values of $x$ and y are

(A) $\frac{3}{4}, \frac{33}{4}$

(B) $\frac{3}{4}, -\frac{33}{4}$

(C) $\frac{3}{4}, \frac{33}{5}$

(D) $-\frac{3}{4}, \frac{33}{5}$

45. If $z = x + iy$ and the amplitude of $(z - 1)$ is $\frac{\pi}{2}$, then the locus of z is

(A) $x = 1, y > 0$

(B) $x = 1, y < 0$

(C) $x = -1, y > 0$

(D) $x = -1, y < 0$

46. If $1, \omega, \omega^2$ are the cube roots of the unity, then the value of $(1 + \omega)^3 + (1 + \omega^2)^3$ is equal to

(A) $-2$

(B) $-1$

(C) 0

(D) 2

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**Space for Rough Work**

47. If A, B, C are angles of a triangle, $x$ = cis A; y = cis B; z = cis C, (where cis A = cos A + i sin A; cis B = cos B + i sin B and cis C = cos C + i sin C) then the value of $xyz$ is

(A) 1

(B) –1

(C) 0

(D) 2

48. The sum ${}^nC_0 + 3\,{}^nC_1 + 3^2\,{}^nC_2 + \ldots..3^n\,{}^nC_n$ is

(A) $4^{n-1}$

(B) $4^n$

(C) $3^{n+1}$

(D) $3^{n+2}$

49. $\lim_{x \to 0} \frac{a^x - 1}{b^x - 1}$ $(a > 0, b > 0$ and $b \neq 1)$

(A) $\log_b a$

(B) $2 \log_b a$

(C) $\frac{1}{2} \log_b a$

(D) $\infty$

**Space for Rough Work**

**50.** If $f(x) = \begin{cases} k^2x - k, & \text{if } x \geq 1 \\ 2, & \text{if } x < 1 \end{cases}$ is a continuous function on real number set, then the values of k are

(A) 2 or –1

(B) 1 or –1

(C) 2 or 1

(D) 2 or –2

**51.** $\lim\limits_{x \to 2+} ([x] + x)$ is

(A) 4

(B) – 4

(C) 2

(D) – 2

**52.** If $\begin{bmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}$ is inverse of $\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 0 & k \end{bmatrix}$; then the value of k is

(A) 0

(B) 1

(C) – 1

(D) 2

**53.** $\cot 67\frac{1}{2}^\circ$ is

(A) $\sqrt{2} + 1$

(B) $\sqrt{2}$

(C) $1 - \sqrt{2}$

(D) $\sqrt{2} - 1$

**Space for Rough Work**

54. Find the value of k if the points (k, –1); (2, 1) and (4, 5) are collinear.

(A) 1

(B) 1/2

(C) 0

(D) none.

55. Find the value of p if the straight lines $x + p = 0$; $y + 2 = 0$; $3x + 2y + 5 = 0$ are concurrent.

(A) 1/2

(B) 1/3

(C) 1

(D) none

56. The angle between the lines $2x + y + 4 = 0$ and $y - 3x = 7$ is

(A) $\pi/4$

(B) $\pi/3$

(C) $\pi/2$

(D) none

57. The perpendicular distance from the point (–3, 4) to the straight line $5x - 12y = 2$ is

(A) 4

(B) 3

(C) 5

(D) none

**Space for Rough Work**

58. If the line $3x + 2by + 5 = 0$ is a diameter of the circle $x^2 + y^2 - 6x + 2y = 0$, then b is

(A) 3

(B) 7

(C) $-1$

(D) 5

59. The direction cosines of the line joining the points (4, –7, 3); (6, –5, 2) are

(A) $\pm(2/3,\ 2/3,\ 2/3)$

(B) $\pm(1/4,\ 2/4,\ 1/4)$

(C) $\pm(2/3,\ 2/3,\ 1/3)$

(D) $\pm(2,\ 2,\ 1)$

60. Find the angle between the lines whose direction ratios are (1, 1, 2); $(\sqrt{3}, -\sqrt{3}, 0)$

(A) $\pi/2$

(B) $\pi$

(C) $\pi/3$

(D) $\pi/4$

61. The equation of the sphere whose centre is (3, 1, 2) and radius is 5 is

(A) $x^2 + y^2 + z^2 - 6x + 2y + 4z - 11 = 0$

(B) $x^2 + y^2 + z^2 - 6x - 2y - 4z - 11 = 0$

(C) $x^2 - y^2 - 6x - 2y - 4z + 11 = 0$

(D) $x^2 - y^2 + z^2 + 6x - 2y - 4z + 11 = 0$

**Space for Rough Work**

62. The distance of the point (1, –2, 8) from the plane $2x-3y+6z=63$ is

(A) 1

(B) 1/2

(C) 0

(D) none

63. If $\sin\theta = 4/5$ and $\theta$ is not in first quadrant, the value of $\cos\theta$ is

(A) – 3/5

(B) 3/5

(C) 2/5

(D) – 2/5

64. If $\tan A = 4/3$, then the value of $\sin 2A$ is

(A) 21/25

(B) 23/25

(C) 24/25

(D) –24/25

65. The general solution of the equation $3 \operatorname{cosec} x = 4 \sin x$ is (n is an integer.)

(A) $n\pi \pm \pi/3$

(B) $\pi \pm \pi/2$

(C) $n\pi \pm \pi/6$

(D) $n\pi \pm 2\pi/3$

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**Space for Rough Work**

66. The value of $\cos^{-1}(\cos 4\pi/3)$ is

(A) $\pi/6$

(B) $2\pi/6$

(C) $2\pi/3$

(D) $\pi/3$

67. If 5, 12, 13 are the sides of a triangle, then the circum radius is

(A) 13

(B) $\frac{13}{2}$

(C) $-\frac{13}{2}$

(D) $\frac{13}{3}$

68. If $\vec{a} = 2i + 4j - 5k$; $\vec{b} = i + j + k$ and $\vec{c} = j + 2k$, then the unit vector in the opposite direction of $\vec{a} + \vec{b} + \vec{c}$ is

(A) $-\frac{1}{7}(3i + 6j - 2k)$

(B) $\frac{1}{7}(3i + 6j - 2k)$

(C) $-\frac{1}{7}(3i + 6j + 2k)$

(D) $-\frac{1}{7}(3i - 6j - 2k)$

**Space for Rough Work**

69. If the vectors $2i + \lambda j - k$ and $4i - 2j + 2k$ are perpendicular to each other, then the value of $\lambda$ is

(A) 1

(B) 2

(C) 3

(D) 4

70. The area of parallelogram for which the vectors $\vec{a} = 2i - 3j$ and $\vec{b} = 3i - k$ are adjacent sides is

(A) $\sqrt{90}$

(B) $\sqrt{91}$

(C) $\sqrt{92}$

(D) $\sqrt{94}$

71. If the vectors $\vec{a} = 2i - j + k$; $\vec{b} = i + 2j - 3k$ and $\vec{c} = 3i + pj + 5k$ are coplanar, then the value of p is

(A) 4

(B) – 4

(C) 3

(D) –3

**Space for Rough Work**

72. The value of $(\vec{a} + \vec{b}) \cdot (\vec{b} + \vec{c}) \times (\vec{c} + \vec{a})$ is

(A) $2[\vec{b}\ \vec{a}\ \vec{c}]$

(B) $[\vec{a}\ \vec{b}\ \vec{c}]$

(C) $2[\vec{a}\ \vec{b}\ \vec{c}]$

(D) $2[\vec{a}\ \vec{c}\ \vec{b}]$

73. The differential equation whose solution is $(x - h)^2 + (y - k)^2 = a^2$, is (a is a constant and h, k are parameters.)

(A) $[1 + (dy/dx)^2]^3 = a^2 d^2y/dx^2$

(B) $[1 + (dy/dx)]^3 = a^2 d^2y/dx^2$

(C) $[1 - (dy/dx)]^3 = a^2 d^2y/dx^2$

(D) $[1 + (dy/dx)]^3 = a^3 d^2y/dx^2$

74. The degree of the differential equation $y = x\frac{dy}{dx} + \sqrt{\left[1 + \left(\frac{dy}{dx}\right)^2\right]}$ is

(A) 1

(B) 2

(C) 0

(D) 3

**Space for Rough Work**

75. Solution of the differential equation $\frac{dy}{dx} = \frac{x(2 \log x + 1)}{\sin y + y \cos y}$ is

(A) $y \sin y = x^2 \log x + \frac{x^2}{2} + c$

(B) $y \cos y = x^2 (\log x + 1) + c$

(C) $y \cos y = x^2 (\log x + 1) + \frac{x^2}{2} + c$

(D) $y \sin y = x^2 \log x + c$

76. Solution of the differential equation $(x + 2y^3) \frac{dy}{dx} = y$ is

(A) $x = y^3 + cy$

(B) $x^3 = y^3 + cy$

(C) $x = y^3 + cy^2$

(D) $x = x^2 + cy$

77. Solution of the differential equation

$$x = 1 + xy \frac{dy}{dx} + \frac{x^2y^2}{2!}\left(\frac{dy}{dx}\right)^2 + \frac{x^3y^3}{3!}\left(\frac{dy}{dx}\right)^2 + \ldots\ldots \text{ is}$$

(A) $y = \log x + c$

(B) $y^2 = (\log x)^2 + c$

(C) $y = \log x + xy$

(D) $xy = x^y + c$

**Space for Rough Work**

78. If $A = \begin{bmatrix} -6 & 5 \\ -7 & 6 \end{bmatrix}$ and AB = I, then B is

(A) $\begin{bmatrix} 6 & 5 \\ 7 & 6 \end{bmatrix}$

(B) $\begin{bmatrix} -6 & 5 \\ -7 & 6 \end{bmatrix}$

(C) $\begin{bmatrix} -6 & -5 \\ -7 & 6 \end{bmatrix}$

(D) $\begin{bmatrix} 6 & 5 \\ -7 & -6 \end{bmatrix}$

79. The roots of the following equation

$\begin{vmatrix} x & 3 & 7 \\ 2 & x & 2 \\ 7 & 6 & x \end{vmatrix} = 0$ is

(A) $x = -9, 2, 7$

(B) $x = 9, 2, 7$

(C) $x = 9, -2, 7$

(D) $x = -9, 2, -7$

80. If $p + q + r = a + b + c = 0$, then the determinant $\begin{vmatrix} pa & qb & rc \\ qc & ra & pb \\ rb & pc & qa \end{vmatrix}$ equals

(A) 0

(B) 1

(C) pa + qb + rc

(D) pa – qb – rc

**Space for Rough Work**

81. A ship will sink if it does not displace water equal to its own

(A) Volume

(B) Density

(C) Surface Area

(D) Weight

82. If the momentum of a given particle is doubled, then its kinetic energy will be

(A) halved

(B) doubled

(C) quadrapled

(D) same

83. Two railway wagons of masses 12 and 10 tonnes moving in the same direction at speeds 3 m/s and 5 m/s respectively collide and then move together. Their common speed is given by

(A) 3.91 m/s

(B) 4.91 m/s

(C) 5.91 m/s

(D) 6.91 m/s

84. The period of oscillation of a simple pendulum depends on

(A) Mass of Bob

(B) Radius of Bob

(C) Density of Bob

(D) Effective length

**Space for Rough Work**

85. The period of vibration of a pendulum is least at sea level where the latitude is

(A) 30 °C

(B) 45 °C

(C) 60 °C

(D) 90 °C

86. In an experiment to determine the Young's modulus of the material of a wire, the length of the wire and the suspended mass are doubled. Then the Young's modulus of the wire

(A) becomes double

(B) becomes four times

(C) remains unchanged

(D) becomes half

87. What is the velocity ratio of a third system of pulleys?

(A) $2^n$

(B) $2^n - 1$

(C) $2^{n-1}$

(D) $2^{n+1}$

88. The moment of inertia of a quadrant about its x-x axis is given by

(A) $0.055\ r^4$

(B) $0.04\ r^4$

(C) $0.06\ r^4$

(D) $0.77\ r^4$

**Space for Rough Work**

89. Impulse gives a measure of the product of

(A) Force and Velocity

(B) Time and Acceleration

(C) Force and Displacement

(D) Force and Time

90. The gear train in which the driving and driven shafts are Co-axial or Coincident is called as

(A) Compound

(B) Reverted

(C) Epicycle

(D) Simple

91. In case of motion of two bodies of weights $W_1$ and $W_2$ ($W_1 > W_2$) connected by a string passing over a smooth pulley, the tension T in the string is given by

(A) $\frac{W_1 W_2}{W_1 + W_2}$

(B) $\frac{2W_1 W_2}{W_1 + W_2}$

(C) $\frac{W_1 W_2}{W_1 - W_2}$

(D) $\frac{2W_1 W_2}{W_1 - W_2}$

**Space for Rough Work**

92. A body of mass m is suspended from a string of length $l$. What is the minimum horizontal velocity that should be given to the body in its lowest position so that it may complete full revolution in the vertical plane with the point of suspension at the center of circle ?

(A) $\sqrt{2gl}$

(B) $\sqrt{3gl}$

(C) $\sqrt{4gl}$

(D) $\sqrt{5gl}$

93. The reverse of the diametral pitch is called

(A) Module

(B) Addendum

(C) Dedendum

(D) Clearance

94. The angle of repose ($\alpha$) holds the following relation with the angle of friction ($\phi$) in the condition of limiting equilibrium :

(A) $\alpha = \phi$

(B) $\alpha = 2\phi$

(C) $\alpha = 3\phi$

(D) $\alpha = 4\phi$

95. The coefficient of restitution of a perfectly plastic impact is

(A) 0

(B) 1

(C) 2

(D) 3

**Space for Rough Work**

96. Which of the following is a vector quantity ?
(A) Energy
(B) Mass
(C) Momentum
(D) Angle

97. A particle is acted upon by a force of constant magnitude which is always perpendicular to the velocity of the particle. The motion takes place in a plane. It follows that :
(A) Its velocity is constant.
(B) It acceleration is constant.
(C) Its motion is linear.
(D) Its motion is circular.

98. CG of a solid cone lies on the axis at the height
(A) one fourth of the total height above base
(B) one third of the total height above base
(C) one half of the total height above base
(D) three eighth of the total height above base

99. The centre of percussion of the homogeneous rod of length L suspended at the top will be
(A) L/3
(B) 3L/4
(C) 2L/3
(D) 3L/8

100. MI of a thin circular ring of radius r and mass M about an axis perpendicular to plane of ring is
(A) $\pi r^4/2$
(B) $Mr^2$
(C) $Mr^2/2$
(D) $2\,Mr^2/3$

**Space for Rough Work**

101. The coefficient of friction depends on

(A) area of contact

(B) shape of surface

(C) strength of surface

(D) nature of surface

102. On a ladder resting on smooth ground and leaning against vertical wall, the force of friction will be

(A) towards the wall at its upper end

(B) away from wall at its upper end

(C) upwards at its upper end

(D) downwards at its upper end

103. If rain is falling in the opposite direction of the movement of a pedestrian, he has to hold his umbrella

(A) more inclined when moving

(B) less inclined when moving

(C) more inclined when standing

(D) less inclined when standing

104. A projectile is fired at an angle $\theta$ to the vertical. Its horizontal range will be maximum when $\theta$ is

(A) 0 °C

(B) 30 °C

(C) 45 °C

(D) 60 °C

**Space for Rough Work**

105. A flywheel on a motor goes from rest to 1000 RPM in 6 seconds. The number of revolutions made is equal to

(A) 25

(B) 50

(C) 75

(D) 100

106. A pair of smith's tongs is an example of the lever of

(A) Zeroth order

(B) First order

(C) Second order

(D) Third order

107. When P is the effort and W is the load, then linear law of machines is given by the following (m, c are constant) :

(A) $W = m P + c$

(B) $W = m P - c$

(C) $P = m W - c$

(D) $P = W m + c$

108. If V is the vertical load at the support end and H is the horizontal tension, then the maximum tension in the string is equal to

(A) $\sqrt{V^2 + H^2}$

(B) $\sqrt{V^2 - H^2}$

(C) $\sqrt{V + H}$

(D) $\sqrt{V - H}$

**Space for Rough Work**

109. A circular disc of weight W rolls down an inclined plane of inclination θ. If force of the friction be F, then the total net force on the disc parallel to plane is equal to

(A) $W - F \sin \theta$

(B) $W \sin \theta - F$

(C) $W \cos \theta - F$

(D) $F \cos \theta - W$

110. If a body transmitting torque T kg m at N rpm, the H.P transmitted will be

(A) $\frac{TN}{75}$

(B) $\frac{TN}{4500}$

(C) $\frac{2\pi NT}{4500}$

(D) $\frac{2\pi NT}{75}$

111. If the tension in the cable supporting the lift moving upwards is twice the tension when the lift is moving downwards, the acceleration of the lift is equal to

(A) g/2

(B) g/3

(C) g/4

(D) g/5

112. For a machine to be self locking, its efficiency should be

(A) 100 %

(B) Less than 75 %

(C) Less than 50 %

(D) More than 50 %

**Space for Rough Work**

113. Maximum efficiency of a screw jack for angle of friction $\phi$ is

(A) $\frac{1 + \sin \phi}{1 - \sin \phi}$

(B) $\frac{1 - \sin \phi}{1 + \sin \phi}$

(C) $\frac{1 - \sin \phi}{\sin \phi}$

(D) $\frac{1 - \sin \phi}{\cos \phi}$

114. A jet engine works on the principle of conservation of

(A) Energy

(B) Mass

(C) Angular Momentum

(D) Linear Momentum

115. The angular velocity of a particle changes from 69 rpm to 71 rpm in 30 seconds. Its angular acceleration in rpm is equal to

(A) 1

(B) 2

(C) 4

(D) 8

116. Periodic time of a particle moving with simple harmonic motion is the time taken by the particle for

(A) half oscillation

(B) quarter oscillation

(C) complete oscillation

(D) two oscillation

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**Space for Rough Work**

117. The first law of motion provides the definition of

(A) Momentum

(B) Force

(C) Acceleration

(D) Energy

118. In a simple train of three gears, the third gear will rotate

(A) In the opposite direction to the first gear

(B) In the same direction as the first gear

(C) In any direction

(D) None of the above

119. A satellite is kept on moving in its orbit around the earth due to

(A) Centrifugal Force

(B) Centripetal Force

(C) Resultant Force

(D) Gravitational Force

120. The type of motion when the acceleration is proportional to displacement is called as

(A) Translation

(B) Rotational

(C) Gyroscopic

(D) Simple harmonic

**Space for Rough Work**