

HORIZON ACADEMY[®]

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(Divisions of Horizon Study Circle Pvt. Ltd.)

Name.:

Date : 18/10/2015

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Subject Code.: 1 1 1

Time : 3 Hrs.

M.M. : 360

HORIZON TEST SERIES

for
**Engineering
Entrance Exam.**
2016

[Test No. 10]

INSTRUCTIONS FOR STUDENTS

1. Read each question carefully.
2. It is mandatory to use Blue/Black Ball Point Pen to darken the appropriate circle in the answer sheet.
3. Mark should be dark and should complete fill the circle.
4. Rough work must be done on the Question Paper, no additional sheet will be provided for this purpose.
5. Do not use white-fluid or any other rubbing material on answer sheet. No change in the answer once marked.
6. Student cannot use log tables and calculators or any other material in the examination hall.
7. Before attempting the question paper, student should ensure that the test paper contains all pages and no page is missing.
8. Each correct answer carries four marks. One mark will be deducted for each incorrect answer from the total score.
9. Before handing over the answer sheet to the invigilator, candidate should check the particulars have been filled and marked correctly.
10. Immediately after the prescribed examination time is over, the answer sheet to be returned to the invigilator.
11. Use of Calculator and other Electronic device is not permitted.

Test No. 10

Topics of The Test

Physics

Work, Energy and Power.

Chemistry

Solutions.

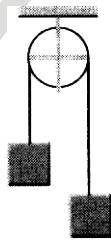
Maths

Cartesian Coordinates & Straight line.

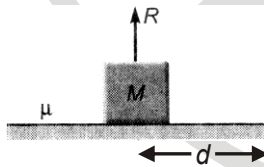
Test No. 10

[PHYSICS]

1. A light inextensible string that goes over a smooth fixed pulley as shown in the figure connects two blocks of masses 0.36 kg and 0.72 kg. Taking $g = 10 \text{ ms}^{-2}$, find the work done (in joule) by string on the block of mass 0.36 kg during the first second after the system is released from rest.



- (A) 8 J (B) 9 J
(C) 7 J (D) 0.48 J
2. A force of $(5 + 3x)$ N acting on a body of mass 20 kg along the x-axis displaces it from $x = 2\text{m}$ to $x = 6\text{m}$. The work done by the force is
- (A) 20 J (B) 48 J
(C) 68 J (D) 86 J
3. If reaction is R and coefficient of friction is μ , what is work done against friction in moving a body by distance d ?

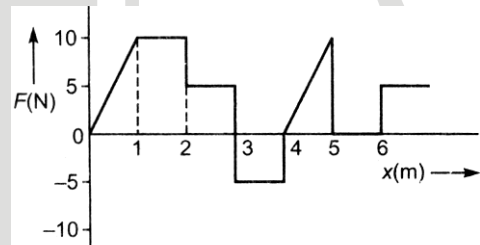


- (A) $\frac{\mu Rd}{4}$ (B) $2\mu Rd$
(C) μRd (D) $\frac{\mu Rd}{2}$

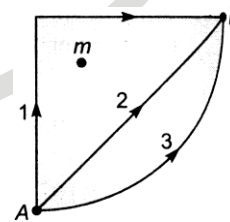
4. A mass of M kg is suspended by a weightless string. The horizontal force that is required to displace it until the string makes an angle of 45° with the initial vertical direction is

- (A) $Mg(\sqrt{2} + 1)$ (B) $Mg\sqrt{2}$
(C) $\frac{Mg}{\sqrt{2}}$ (D) $Mg(\sqrt{2} - 1)$

5. The relationship between the force F and position x of a body is as shown in figure. The work done in displacing the body from $x = 1\text{m}$ to $x = 5\text{m}$ will be



- (A) 30 J (B) 15 J
(C) 25 J (D) 20 J
6. If W_1, W_2 and W_3 represent the work done in moving a particle from A to B along three different paths 1, 2 and 3 respectively (as shown) in the gravitational field of a point mass m . Find the correct relation between W_1, W_2 and W_3



Space for Rough Work

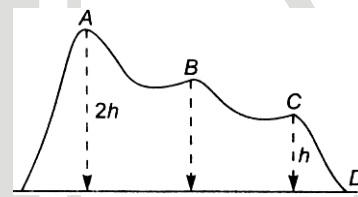
- (A) $W_1 > W_2 > W_3$ (B) $W_1 = W_2 = W_3$
 (C) $W_1 < W_2 < W_3$ (D) $W_2 > W_1 > W_3$
7. A bucket full of water weighs 5 kg, it is pulled from a well 20 m deep. There is a small hole in the bucket through which water leaks at a constant rate of 0.2 kgm^{-1} . The total work done in pulling the bucket up from the well is ($g = 10 \text{ ms}^{-2}$)
 (A) 600 J (B) 400 J
 (C) 100 J (D) 500 J
8. A ball dropped from a height of 2 m rebounds to a height of 1.5 m after hitting the ground. Then the percentage of energy lost is
 (A) 25 (B) 30
 (C) 50 (D) 100
9. A cubical vessel of height 1 m is full of water. What is the amount of work done in pumping water out of the vessel? (Take $g = 10 \text{ ms}^{-2}$)
 (A) 1250 J (B) 5000 J
 (C) 1000 J (D) 2500 J
10. The potential energy function for the force between two atoms in a diatomic molecule is approximately given by $U(x) = \frac{a}{x^{12}} - \frac{b}{x^6}$, where a and b are constants and x is the distance between the atoms. If the dissociation energy of the molecule is $D = [U(x = \infty) - U_{\text{at equilibrium}}]$, D is
 (A) $\frac{b^2}{2a}$ (B) $\frac{b^2}{12a}$
 (C) $\frac{b^2}{4a}$ (D) $\frac{b^2}{6a}$
11. 10 L of water per second is lifted from well through 20 m and delivered with a velocity of 10 ms^{-1} , then the power of the motor is
 (A) 1.5 kW (B) 2.5 kW
 (C) 3.5 kW (D) 4.5 kW

12. A block of mass m at the end of the string is whirled round a vertical circle of radius r . The critical speed of the block at the top of the swing is

- (A) $\left(\frac{r}{g}\right)^{1/2}$ (B) $\frac{g}{r}$
 (C) $\frac{m}{rg}$ (D) $(rg)^{1/2}$

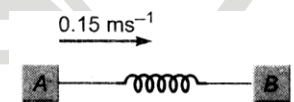
13. A small roller coaster starts at point A with a speed u on a curved track as shown in the figure.

The friction between the roller coaster and the track is negligible and it always remains in contact with the track. The speed of roller coaster at point D on the track will be



- (A) $(u^2 + gh)^{1/2}$ (B) $(u^2 + 2gh)^{1/2}$
 (C) $(u^2 + 4gh)^{1/2}$ (D) u

14. Two rectangular blocks A and B of masses 2 kg and 3 kg respectively are connected by a spring of spring constant 10.8 Nm^{-1} and are placed on a frictionless horizontal surface. The block A was given an initial velocity of 0.15 ms^{-1} in the direction shown in the figure. The maximum compression of the spring during the motion is



- (A) 0.01 m (B) 0.02 m
 (C) 0.05 m (D) 0.03 m

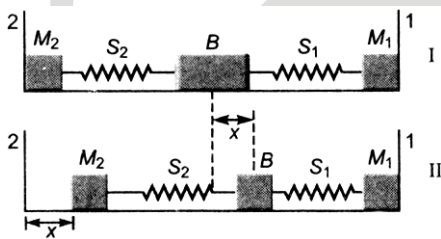
Space for Rough Work

15. A rod of mass m and length l is made to stand at an angle of 60° with the vertical. Potential energy of the rod in this position is

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

16. A block (B) is attached to two unstretched springs S_1 and S_2 with spring constants k and $4k$, respectively (see Fig. I). The other ends are attached to identical supports M_1 and M_2 not attached to the walls. The springs and supports have negligible mass. There is no friction anywhere. The block B is displaced towards wall 1 by a small distance x (Fig. II) and released. The block returns and moves a maximum distance y towards wall 2. Displacements x and y are measured with respect to the equilibrium position of the block B.

The ratio $\frac{y}{x}$ is



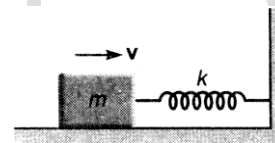
- (A) 4 (B) 2
 (C) $\frac{1}{2}$ (D) $\frac{1}{4}$
17. A spherical ball of mass 20 kg is stationary at the top of a hill of height 100 m. It rolls down a smooth surface to the ground, then climbs up another hill of height 30 m and height of 20 m above the ground. The velocity attained by the ball is
- (A) 40 ms^{-1} (B) 20 ms^{-1}
 (C) 10 ms^{-1} (D) $10\sqrt{30} \text{ ms}^{-1}$

18. Two bodies A and B have masses 20 kg and 5 kg respectively. Each one is acted upon by a force of 4 kg-wt. If they acquire the same kinetic energy in times

t_A and t_B , then the ratio $\frac{t_A}{t_B}$ is

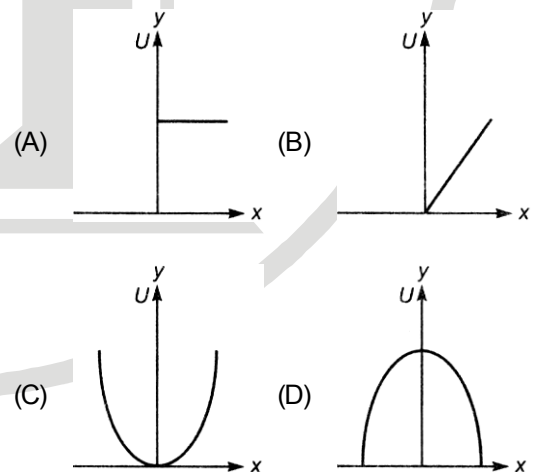
- (A) $\frac{1}{2}$ (B) 2
 (C) $\frac{2}{5}$ (D) $\frac{5}{6}$

19. A block of mass $m = 25 \text{ kg}$ sliding on a smooth horizontal surface with a velocity $v = 3 \text{ ms}^{-1}$ meets the spring of spring constant $k = 100 \text{ Nm}^{-1}$ fixed at one end as shown in figure. The maximum compression of the spring and velocity of block as it returns to the original position respectively are



- (A) 1.5 m, -3 ms^{-1} (B) 1.5 m, 0.01 ms^{-1}
 (C) 1.0 m, 3 ms^{-1} (D) 0.5 m, 2 ms^{-1}

20. Which of the following graphs shows variation of potential energy (U) with position x

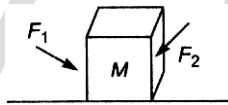


Space for Rough Work

21. An object of mass m is attached to light string which passes through a hollow tube. The object is set into rotation in a horizontal circle of radius, r_1 . If the string is pulled shortening the radius to r_2 , the ratio of new kinetic energy to the original kinetic energy is

- (A) $\left(\frac{r_2}{r_1}\right)^2$ (B) $\left(\frac{r_1}{r_2}\right)^2$
 (C) $\frac{r_1}{r_2}$ (D) $\frac{r_2}{r_1}$

22. A body of mass M is moving with a uniform speed of 10 m/s on frictionless surface under the influence of two forces F_1 and F_2 . The net power of the system is



- (A) $10F_1F_2M$ (B) $10(F_1 + F_2)M$
 (C) $(F_1 + F_2)/M$ (D) zero

23. A car of mass m is driven with an acceleration a along a straight level road against a constant external resistive force R . When the velocity of the car is v , the rate at which engine of the car is doing work, will be

- (A) $R \cdot v$ (B) $ma \cdot v$
 (C) $(R + ma) \cdot v$ (D) $(ma - R) \cdot v$

24. A body of mass 2 kg is projected at 20 ms^{-1} at an angle 60° above the horizontal. Power due to the gravitational force at its highest point is

- (A) 200 W (B) $100\sqrt{3}$ W
 (C) 50 W (D) zero

25. A block of mass 0.50 kg is moving with a speed of 2.00 ms^{-1} on a smooth surface. It strikes another mass of 1.00 kg and then they move together as a single body. The energy loss during the collision is

- (A) 0.16 J (B) 1.00 J
 (C) 0.67 J (D) 0.34 J

26. Two identical mass m moving with velocities u_1 and u_2 collide perfectly inelastically. Find the loss in energy

- (A) $m(u_1 - u_2)^2$ (B) $\frac{m}{4}(u_1 - u_2)^2$
 (C) $\frac{m}{2}(u_1 - u_2)^2$ (D) $m(u_1 - u_2)^3$

27. A bullet of mass 20 g and moving with 600 ms^{-1} collides with a block of mass 4 kg hanging with the string. What is velocity of bullet when it comes out of block if block rises to height 0.2 m after collision ?

- (A) 200 ms^{-1} (B) 150 ms^{-1}
 (C) 400 ms^{-1} (D) 300 ms^{-1}

28. A bomb at rest explodes into 3 parts of the same mass. The momentum of the 2 parts is $-2p\hat{i}$ and $p\hat{j}$. The momentum of the third part will have a magnitude of

- (A) p (B) $\sqrt{3}p$
 (C) $p\sqrt{5}$ (D) zero

29. A body of mass 4 kg moving with velocity 12 ms^{-1} collides with another body of mass 6 kg at rest. If two bodies stick together after collision, then the loss of kinetic energy of system is

- (A) zero (B) 288 J
 (C) 172.8 J (D) 144 J

30. A rod AB of mass M , length L is lying on a horizontal frictionless surface. A particle of mass m travelling along the surface hits the end A of the rod with a velocity v_0 in a direction perpendicular to AB. The collision is completely elastic. After the collision, the particle

comes to rest. The ratio $\frac{m}{M}$ is

- (A) $\frac{\omega^2 L^2}{9v_0^2}$ (B) $\frac{9v_0^2}{\omega^2 L^2}$
 (C) $\frac{9v_0}{\omega L}$ (D) $\frac{\omega L}{9v_0}$

Space for Rough Work

[CHEMISTRY]

31. A 5.2 molal aqueous solution of methyl alcohol, CH_3OH , is supplied. What is the mole fraction of methyl alcohol in the solution ?
 (A) 1.100 (B) 0.190
 (C) 0.086 (D) 0.050
32. 59 cm^3 of 0.2 N HCl is titrated against 0.1 N NaOH solution. The titration is discontinued after adding 50 cm^3 of NaOH. The remaining titration is completed by adding 0.5 N KOH. The volume of KOH required for completing the titration is
 (A) 12 cm^3 (B) 10 cm^3
 (C) 25 cm^3 (D) 10.5 cm^3
33. 10 cm^3 of 0.1 N monobasic acid requires 15 cm^3 of sodium hydroxide solution whose normality is
 (A) 1.5 N (B) 0.15 N
 (C) 0.066 N (D) 0.66 N
34. Which one is correct ?
 (A) Molality changes with temperature
 (B) Molality does not change with temperature
 (C) Molarity does not change with temperature
 (D) Normality does not change with temperature
35. The volume of 10 N and 4 N HCl required to make 1 L of 7 N HCl are
 (A) 0.50 L of 10 N HCl and 0.50 L of 4 N HCl
 (B) 0.60 L of 10 N HCl and 0.40 L of 4 N HCl
 (C) 0.80 L of 10 N HCl and 0.20 L of 4 N HCl
 (D) 0.75 L of 10 N HCl and 0.25 L of 4 N HCl
36. Density of a 2.05 M solution of acetic acid in water is 1.02 g/mL . The molality of the solution is
 (A) 1.14 mol kg^{-1} (B) 3.28 mol kg^{-1}
 (C) 2.28 mol kg^{-1} (D) 0.44 mol kg^{-1}
37. At STP, a container has 1 mole of Ar, 2 moles of CO_2 , 3 moles of O_2 and 4 moles of N_2 . Without changing the total pressure if one mole of O_2 is removed, the partial pressure of O_2 is
 (A) changed by about 16%
 (B) halved
 (C) changed by 26%
 (D) unchanged
38. 6.02×10^{20} molecules of urea are present in 100 mL of its solution. The concentration of urea solution is (Avogadro constant, $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$)
 (A) 0.001 M (B) 0.01 M
 (C) 0.02 M (D) 0.1 M
39. What amount of water is added in 40 mL of NaOH (0.1 N) which is neutralised by 50 mL of HCl (0.2 N)?
 (A) 80 mL (B) 60 mL
 (C) 40 mL (D) 90 mL
40. How much $\text{K}_2\text{Cr}_2\text{O}_7$ (Mol. wt. = 294.19) is required to prepare one litre of 0.1 N solution ?
 (A) 9.8063 g (B) 7.3548 g
 (C) 3.6774 g (D) 4.903 g
41. On mixing, heptane and octane form an ideal solution. At 373 K, the vapour pressures of the two liquid components (heptane and octane) are 105 kPa and 45 kPa respectively. Vapour pressure of the solution obtained by mixing 25 g of heptane and 35 g of octane will be (molar mass of heptane = 100 g mol^{-1} and of octane = 114 g mol^{-1}).
 (A) 72.0 kPa (B) 36.1 kPa
 (C) 96.2 kPa (D) 144.5 kPa
42. Vapour pressure of pure 'A' is 70 mm of Hg at 25°C . It forms an ideal solution with 'B' in which mole fraction of A is 0.8. If the vapour pressure of the solution is 84 mm of Hg at 25°C , the vapour pressure of pure 'B' at 25°C is
 (A) 28 mm (B) 56 mm
 (C) 70 mm (D) 140 mm
43. A mixture of ethyl alcohol and propyl alcohol has a vapour pressure of 290 mm at 300 K. The vapour pressure of propyl alcohol is 200 mm. If the mole fraction of ethyl alcohol is 0.6, its vapour pressure (in mm) at the same temperature will be
 (A) 350 (B) 300
 (C) 700 (D) 360
44. Azeotropic mixture of HCl and water has
 (A) 48% HCl (B) 22.2% HCl
 (C) 36% HCl (D) 20.2% HCl

Space for Rough Work

45. An azeotropic mixture of two liquids has boiling point lower than either of them, when it
 (A) shows a negative deviation from Raoult's law
 (B) shows no deviation from Raoult's law
 (C) shows positive deviation from Raoult's law
 (D) is saturated
46. A 5% solution of cane sugar (molar mass 342) is isotonic with 1% of a solution of an unknown solute. The molar mass of unknown solute in g/mol is
 (A) 136.2 (B) 171.2
 (C) 68.4 (D) 34.2
47. The empirical formula of a non-electrolyte is CH_2O . A solution containing 6g of the compound exerts the same osmotic pressure as that of 0.05 M glucose solution at the same temperature. The molecular formula of the compound is
 (A) $\text{C}_2\text{H}_4\text{O}_2$ (B) $\text{C}_3\text{H}_6\text{O}_3$
 (C) $\text{C}_5\text{H}_{10}\text{O}_5$ (D) $\text{C}_4\text{H}_8\text{O}_4$
48. At 25°C , the highest osmotic pressure is exhibited by 0.1 M solution of
 (A) urea (B) glucose
 (C) KCl (D) CaCl_2
49. Colligative properties of a solution depends upon
 (A) nature of both solvent and solute
 (B) nature of solute only
 (C) number of solvent particles
 (D) the number of solute particles
50. If 0.1 M solutions of each electrolyte are taken and if all electrolytes are completely dissociated, then whose boiling point will be highest ?
 (A) Glucose (B) KCl
 (C) BaCl_2 (D) $\text{K}_4[\text{Fe}(\text{CN})_6]$
51. The vapour pressure of water at 20°C is 17.5 mm Hg. If 18 g of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) is added to 178.2 g of water at 20°C , the vapour pressure of the resulting solution will be
 (A) 17.675 mm Hg (B) 15.750 mm Hg
 (C) 16.500 mm Hg (D) 17.325 mm Hg
52. Isotonic solutions have equal
 (A) vapour pressure (B) osmotic pressure
 (C) boiling point (D) freezing point
53. Which one is a colligative property ?
 (A) Boiling point
 (B) Vapour pressure
 (C) Osmotic pressure
 (D) Freezing point
54. Relative lowering of vapour pressure of a dilute solution is 0.2. What is the mole fraction of the non-volatile solute ?
 (A) 0.8 (B) 0.5
 (C) 0.3 (D) 0.2
55. For an aqueous solution, freezing point is -0.186°C . Elevation of the boiling point of the same solution is ($K_f = 1.86^\circ \text{mol}^{-1} \text{kg}$ and $k_b = 0.512^\circ \text{mol}^{-1} \text{kg}$)
 (A) 0.186° (B) 0.0512°
 (C) 1.86° (D) 5.12°
56. van't Hoff factor of $\text{Ca}(\text{NO}_3)_2$ is
 (A) one (B) two
 (C) three (D) four
57. Phenol dimerises in benzene having van't Hoff factor 0.54. What is the degree of association ?
 (A) 1.92 (B) 0.98
 (C) 1.08 (D) 0.92
58. The elevation in boiling point of a solution of 13.44 g of CuCl_2 in 1 kg of water using the following information will be (molecular weight of $\text{CuCl}_2 = 134.4$ and $k_b = 0.52 \text{ Km}^{-1}$)
 (A) 0.16 (B) 0.05
 (C) 0.1 (D) 0.2
59. If α is the degree of dissociation of Na_2SO_4 , the van't Hoff factor (i) used for calculating the molecular mass is
 (A) $1 - 2\alpha$ (B) $1 + 2\alpha$
 (C) $1 - \alpha$ (D) $1 + \alpha$

Space for Rough Work

60. Distribution law was given by
 (A) Henry (B) van't Hoff
 (C) Nernst's (D) Ostwald

[MATHEMATICS]

61. If each of the vertices of a triangle has integral coordinates, then the triangle will not be
 (A) right angled (B) equilateral
 (C) isosceles (D) none of these
62. If a vertex of a triangle is $(1, 1)$ and the mid-points of two sides through this vertex are $(-1, 2)$ and $(3, 2)$, then the centroid of the triangle, is
 (A) $\left(\frac{1}{3}, \frac{7}{3}\right)$ (B) $\left(1, \frac{7}{3}\right)$
 (C) $\left(-\frac{1}{3}, \frac{7}{3}\right)$ (D) $\left(-1, \frac{7}{3}\right)$
63. If Δ_1 is the area of the triangle formed by the centroid and two vertices of a triangle, Δ_2 is the area of the triangle formed by the mid-points of the sides of the same triangle, then $\Delta_1 : \Delta_2 =$
 (A) 3 : 4 (B) 4 : 1
 (C) 4 : 3 (D) 2 : 1
64. The number of points equidistant to three given distinct non-collinear points, is
 (A) 0 (B) 1
 (C) 2 (D) Infinite
65. The area of the triangle formed by the origin, the point $P(x, y)$ and its reflection in x-axis is
 (A) xy (B) $2|xy|$
 (C) $\frac{1}{2}|xy|$ (D) $|xy|$
66. If the axes are rotated through an angle of 30° in the clockwise direction, the point $(4, 2\sqrt{3})$ in the new system is
 (A) $(2, 3)$ (B) $(2, \sqrt{3})$
 (C) $(\sqrt{3}, 2)$ (D) $(\sqrt{3}, 5)$

67. If α, β, γ are the real roots of the equation $x^3 - 3ax^2 + 3bx - 1 = 0$, then the centroid of the triangle with vertices $\left(\alpha, \frac{1}{\alpha}\right), \left(\beta, \frac{1}{\beta}\right)$ and $\left(\gamma, \frac{1}{\gamma}\right)$ is at the point
 (A) (a, b) (B) $(a/3, b/3)$
 (C) $(a + b, a - b)$ (D) $(3a, 3b)$
68. The incentre of the triangle with vertices $(1, \sqrt{3}), (0, 0)$ and $(2, 0)$ is
 (A) $\left(1, \frac{\sqrt{3}}{2}\right)$ (B) $\left(\frac{2}{3}, \frac{1}{\sqrt{3}}\right)$
 (C) $\left(\frac{2}{3}, \frac{\sqrt{3}}{2}\right)$ (D) $\left(1, \frac{1}{\sqrt{3}}\right)$
69. The vertices of a triangle are $(6, 0), (0, 6)$ and $(6, 6)$. The distance between its circumcentre and orthocentre is
 (A) $2\sqrt{2}$ (B) 2
 (C) $3\sqrt{2}$ (D) 1
70. If the quadrilateral formed by the lines $ax + by + c = 0, a'x + b'y + c = 0, ax + by + c' = 0, a'x + b'y + c' = 0$ have perpendicular diagonals, then
 (A) $b^2 + c^2 = b'^2 + c'^2$
 (B) $c^2 + a^2 = c'^2 + a'^2$
 (C) $a^2 + b^2 = a'^2 + b'^2$
 (D) none of these
71. The straight line $x + 2y - 9 = 0, 3x + 5y - 5 = 0$ and $ax + by - 1 = 0$ are concurrent if the straight line $35x - 22y + 1 = 0$ passes through the point
 (A) (a, b) (B) (b, a)
 (C) $(a, -b)$ (D) $(-a, b)$
72. The circumcentre of the triangle formed by the lines $xy + 2x + 2y + 4 = 0$ and $x + y + 2 = 0$, is
 (A) $(-1, -1)$ (B) $(0, -1)$
 (C) $(1, 1)$ (D) $(-1, 0)$

Space for Rough Work

73. The lines $p(p^2 + 1)x - y + q = 0$ and $(p^2 + 1)^2x + (p^2 + 1)y + 2q = 0$ are perpendicular to a common line for
 (A) no value of p
 (B) exactly one value of p
 (C) exactly two values of p
 (D) more than two values of p
74. A straight line through the origin meets the parallel lines $4x + 2y = 9$ and $2x + y + 6 = 0$ at points P and Q respectively. Then, the point O divides the segment PQ in the ratio
 (A) 1 : 2 (B) 3 : 4
 (C) 2 : 1 (D) 4 : 3
75. The point $(3, 2)$ is reflected in the y -axis and then moved a distance of 5 units towards the negative side of y -axis. The coordinates of the point thus obtained are
 (A) $(3, -3)$ (B) $(-3, 3)$
 (C) $(3, 3)$ (D) $(-3, -3)$
76. The line parallel to the x -axis and passing through the intersection of the lines $ax + 2by + 3b = 0$ and $bx - 2ay - 3a = 0$, where $(a, b) \neq (0, 0)$, is
 (A) above the x -axis at a distance of $2/3$ from it.
 (B) above the x -axis at a distance of $3/2$ from it.
 (C) below the x -axis at a distance of $2/3$ from it.
 (D) below the x -axis at a distance of $3/2$ from it.
77. The bisector of the acute angle formed between the lines $4x - 3y + 7 = 0$ and $3x - 4y + 14 = 0$ has the equation
 (A) $x + y + 3 = 0$ (B) $x - y - 3 = 0$
 (C) $x - y + 3 = 0$ (D) $3x + y - 7 = 0$
78. The equation of the bisector of that angle between the lines $x + y = 3$ and $2x - y = 2$ which contains the point $(1, 1)$ is
 (A) $(\sqrt{5} - 2\sqrt{2})x + (\sqrt{5} + \sqrt{2})y - 3\sqrt{5} + 2\sqrt{2} = 0$
 (B) $(\sqrt{5} + 2\sqrt{2})x + (\sqrt{5} - \sqrt{2})y - 3\sqrt{5} - 2\sqrt{2} = 0$
 (C) $3x = 10$
 (D) none of these
79. In a triangle ABC the equation of the bisector of angle B is $y = x$. If $A = (2, 6)$ and $B = (1, 1)$, then equation of side BC is
 (A) $2x + y - 3 = 0$ (B) $x - 5y + 4 = 0$
 (C) $x - 6y + 5 = 0$ (D) none of these
80. If the sum of distances of a point from two perpendicular lines is unity, then its locus is
 (A) a circle (B) an ellipse
 (C) a hyperbola (D) none of these
81. The distance of the line $2x - 3y = 4$ from the point $(1, 1)$ measured parallel to the line $x + y = 1$ is
 (A) $\sqrt{2}$ (B) $\frac{5}{\sqrt{2}}$
 (C) $\frac{1}{\sqrt{2}}$ (D) 6
82. The base vertices of an isosceles triangle PQR are $Q(1, 3)$ and $R(-2, 7)$. The vertex P can be
 (A) $(1, 6)$ (B) $(1/2, 5)$
 (C) $(5/6, 6)$ (D) none of these
83. Let $A(2, -3)$ and $B(-2, 1)$ be vertices of a triangle ABC . If the centroid of this triangle moves on the line $2x + 3y = 1$, then the locus of the vertex C is the line
 (A) $3x - 2y = 3$ (B) $2x - 3y = 7$
 (C) $3x + 2y = 5$ (D) $2x + 3y = 9$
84. The equation of the straight line passing through the point $(4, 3)$ and making intercepts on the coordinate axes whose sum is -1 , is
 (A) $\frac{x}{2} - \frac{y}{3} = 1$ and $\frac{x}{-2} + \frac{y}{1} = 1$
 (B) $\frac{x}{2} - \frac{y}{3} = -1$ and $\frac{x}{-2} + \frac{y}{1} = -1$
 (C) $\frac{x}{2} + \frac{y}{3} = 1$ and $\frac{x}{2} + \frac{y}{1} = 1$
 (D) $\frac{x}{2} + \frac{y}{3} = -1$ and $\frac{x}{-2} + \frac{y}{1} = -1$

Space for Rough Work

85. The line L given by $\frac{x}{5} + \frac{y}{b} = 1$ passes through the point (13, 32). The line K is parallel to L and has the equation $\frac{x}{c} + \frac{y}{3} = 1$. Then the distance between L and K is
- (A) $\frac{17}{\sqrt{15}}$ (B) $\frac{23}{\sqrt{17}}$
 (C) $\frac{23}{\sqrt{15}}$ (D) $\sqrt{17}$
86. A straight line L through the point (3, -2) is inclined at an angle of 60° to the line $\sqrt{3}x + y = 1$. If L also intersects the x-axis, then the equation of L is
- (A) $\sqrt{3}x + y + 2 - 3\sqrt{3} = 0$
 (B) $y - \sqrt{3}x + 2 + 3\sqrt{3} = 0$
 (C) $\sqrt{3}y - x + 3 + 2\sqrt{3} = 0$
 (D) $\sqrt{3}y + x - 3 + 2\sqrt{3} = 0$
87. The lines $x + y = |a|$ and $ax - y = 1$ intersect each other in the first quadrant. Then the set of all possible values of a is the interval :
- (A) $[1, \infty)$ (B) $(-1, \infty)$
 (C) $(-1, 1)$ (D) $(0, \infty)$

ASSERTION-REASON TYPE MCQs

In this section each question contains STATEMENT-1 (Assertion) and STATEMENT-2 (Reason). Each of these questions has following four choices (1), (2), (3) and (4), only one of which is the correct answer.

- Statement-1 is True, Statement-2 is true; Statement-2 is a correct explanation for Statement-1.
- Statement-1 is True, Statement-2 is True, Statement-2 is not a correct explanation for Statement1
- Statement-1 is True, Statement-2 is False.
- Statement-1 is False, Statement-2 is True.

88. **Statement 1** : The lines $(a + b)x + 2(a - b)y = 2a$ are concurrent at the point (1, 1/2).

Statement 2 : $L_1 + \lambda L_2 = 0$ represents the equation of family of lines passing through the intersection of the lines $L_1 = 0$ and $L_2 = 0$ for all non-zero finite values of λ .

- (A) 1 (B) 2
 (C) 3 (D) 4

89. **Statement-1** : Reflection of the point (-3, 2) in the line $x + y = 0$ is (-2, 3).

Statement-2 : The reflection of a point $P(\alpha, \beta)$ in the line $ax + by + c = 0$ is the point $Q(\alpha', \beta')$, if

$\left(\frac{\alpha + \alpha'}{2}, \frac{\beta + \beta'}{2}\right)$ lies on the line.

- (A) 1 (B) 2
 (C) 3 (D) 4

90. ABC is a triangle formed by the lines $xy = 0$ and $x + y = 1$.

Statement 1 : Orthocentre of the triangle ABC is at the origin.

Statement 2 : Circumcentre of ΔABC is at the point (1/2, 1/2).

- (A) 1 (B) 2
 (C) 3 (D) 4

Space for Rough Work

