



PREVIOUS IPE PAPERS

AP - MAY 2024

Time : 3 Hours

MATHS-1A

Max.Marks : 75

SECTION-A

I. Answer ALL the following VSAQ:

10 × 2 = 20

1. If $A = \left\{0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}\right\}$ & $f: A \rightarrow B$ is a surjection defined by $f(x) = \cos x$ then find B.2. Find the domain of the real function $f(x) = \frac{1}{\sqrt{1-x^2}}$ 3. If $A = \begin{bmatrix} 2 & 4 \\ -1 & k \end{bmatrix}$ and $A^2 = O$, then find the value of k4. Define Trace of matrix. Find the trace of $\begin{bmatrix} 1 & 3 & -5 \\ 2 & -1 & 5 \\ 2 & 0 & 1 \end{bmatrix}$ 5. If $\vec{a} = 2\vec{i} + 5\vec{j} + \vec{k}$, $\vec{b} = 4\vec{i} + m\vec{j} + n\vec{k}$ are collinear vectors then find m, n

6. Find the vector equation of the plane passing through the points (0,0,0), (0,5,0) and (2,0,1)

7. If $\vec{a} = \vec{i} + 2\vec{j} - 3\vec{k}$, $\vec{b} = 3\vec{i} - \vec{j} + 2\vec{k}$ then show that $\vec{a} + \vec{b}$, $\vec{a} - \vec{b}$ are perpendicular.8. Sketch the graph of the function $\cos 2x$ in the interval $[0, \pi]$ 9. Prove that $\cos^2 52 \frac{1^\circ}{2} - \sin^2 22 \frac{1^\circ}{2}$ 10. If $\sinh x = 3/4$ then find $\cosh 2x$ and $\sinh 2x$.

SECTION-B

II. Answer any FIVE of the following SAQs:

5 × 4 = 20

11. If $A = \begin{bmatrix} 1 & -2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{bmatrix}$ then find $A^3 - 3A^2 - A - 3I$, where I is unit matrix of order 3.12. If $\vec{i}, \vec{j}, \vec{k}$ are unit vectors along the positive directions of the coordinate axes, then show that the four points $4\vec{i} + 5\vec{j} + \vec{k}$, $-\vec{j} - \vec{k}$, $3\vec{i} + 9\vec{j} + 4\vec{k}$, $-4\vec{i} + 4\vec{j} + 4\vec{k}$ are coplanar.13. If $\vec{a} = 2\vec{i} + 2\vec{j} - 3\vec{k}$, $\vec{b} = 3\vec{i} - \vec{j} + 2\vec{k}$ then find the angle between $2\vec{a} + \vec{b}$ and $\vec{a} + 2\vec{b}$.14. Show that $\cos^4 \frac{\pi}{8} + \cos^4 \frac{3\pi}{8} + \cos^4 \frac{5\pi}{8} + \cos^4 \frac{7\pi}{8} = \frac{3}{2}$ 15. Solve $\sqrt{2}(\sin x + \cos x) = \sqrt{3}$ 16. Prove that $\sin^{-1} \frac{3}{5} + \cos^{-1} \frac{12}{13} = \cos^{-1} \frac{33}{65}$ 17. In ΔABC , if $\frac{1}{a+c} + \frac{1}{b+c} = \frac{3}{a+b+c}$ then show that $C = 60^\circ$

SECTION-C

III. Answer any FIVE of the following LAQs:

5 × 7 = 35

18. If $f: A \rightarrow B$, $g: B \rightarrow C$ are two bijective functions then prove that $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$ 19. Using mathematical induction, prove that $a + ar + ar^2 + \dots + ar^{n-1}$ terms $= \frac{a(r^n - 1)}{r - 1}$, $r \neq 1$ 20. If $\begin{vmatrix} a & a^2 & 1+a^3 \\ b & b^2 & 1+b^3 \\ c & c^2 & 1+c^3 \end{vmatrix} = 0$ and $\begin{vmatrix} a & a^2 & 1 \\ b & b^2 & 1 \\ c & c^2 & 1 \end{vmatrix} \neq 0$ then show that the $abc = -1$ 21. Solve by using matrix inversion method $x - y + 3z = 5$, $4x + 2y - z = 0$, $-x + 3y + z = 5$ 22. If $\vec{a} = 2\vec{i} + \vec{j} - 3\vec{k}$, $\vec{b} = \vec{i} - 2\vec{j} + \vec{k}$, $\vec{c} = -\vec{i} + \vec{j} - 4\vec{k}$, $\vec{d} = \vec{i} + \vec{j} + \vec{k}$, then compute $|(\vec{a} \times \vec{b}) \times (\vec{c} \times \vec{d})|$ 23. In ΔABC , prove that $\sin A + \sin B - \sin C = 4 \sin \frac{A}{2} \cdot \sin \frac{B}{2} \cdot \cos \frac{C}{2}$ 24. In a ΔABC if $a=13$, $b=14$, $c=15$ then show that $R = \frac{65}{8}$, $r=4$, $r_1 = \frac{21}{2}$, $r_2 = 12$, $r_3 = 14$



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MATHS-1B

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Max.Marks : 75

SECTION-A**I. Answer ALL the following VSAQ:****10 × 2 = 20**

- Find the equation of line passing through the point $(-2,4)$ and making intercepts, whose sum is zero.
- If the area of the triangle formed by the straight line $x=0$, $y=0$ and $3x+4y=a$ ($a>0$) is 6, find the value of a .
- If $(3, 2, -1)$, $(4, 1, 1)$ and $(6, 2, 5)$ are three vertices and $(4, 2, 2)$ is the centroid of a tetrahedron find the fourth vertex.
- Find the equation of the plane passing through the point $(1,1,1)$ and parallel to the plane $x+2y+3z-7=0$
- Compute $\lim_{x \rightarrow 0} \frac{a^x - 1}{b^x - 1}$
- Compute $\lim_{x \rightarrow \infty} (\sqrt{x^2 + x} - x)$
- If $y = \log(\sin(\log x))$, find $\frac{dy}{dx}$
- If $y = ae^{nx} + be^{-nx}$, then prove that $y'' = n^2 y$.
- If the increase in the side of a square is 2% then find the approximate percentage of increase in the area of the square.
- Verify Lagrange's mean value theorem for the function $x^2 - 1$ on $[2,3]$

SECTION-B**II. Answer any FIVE of the following SAQs:****5 × 4 = 20**

- $A(5,3)$, $B(3,-2)$ are 2 fixed points. Find the equation of the locus of P, so that the area of triangle PAB is 9 sq.units
- When the axes are rotated through an angle 45° , the transformed equation of a curve is $17x^2 - 16xy + 17y^2 = 225$. Find the original equation of the curve.
- Find the value of k if the angle between the straight lines $4x - y + 7 = 0$, $kx - 5y - 9 = 0$ is 45°
- Show that $f(x) = \begin{cases} \frac{\cos ax - \cos bx}{x^2} & \text{if } x \neq 0 \\ \frac{1}{2}(b^2 - a^2) & \text{if } x = 0 \end{cases}$, is continuous at 0. **15.** Find the derivative of $\tan 2x$ from the first principle.
- Find the equations of the tangent and the normal to the curve $y^4 = ax^3$ at (a,a)
- The volume of a cube is increasing at a rate of 9 cubic centimeters per second. How fast is the surface area increasing when the length of the edge is 10 centimeters?

SECTION-C**III. Answer any FIVE of the following LAQs:****5 × 7 = 35**

- Find the orthocentre of the triangle formed by the vertices $(5,-2)$, $(-1,2)$, $(1,4)$
- If $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represents two parallel lines then prove that
(a) $h^2 = ab$ (b) $af^2 = bg^2$ (c) the distance between the parallel lines is $2\sqrt{\frac{g^2 - ac}{a(a+b)}} = 2\sqrt{\frac{f^2 - bc}{b(a+b)}}$
- Find the condition for the lines joining the origin to the points of intersection of the circle $x^2 + y^2 = a^2$ and line $lx + my = 1$
- Find the angle between the lines whose Dc's are related by $l+m+n=0$ & $l^2 + m^2 - n^2 = 0$
- If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$ then prove that $\frac{dy}{dx} = \frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}$
- Find the angle between the curves $y^2 = 4x$ and $4x^2 + y^2 = 32$
- Find two positive integers x and y such that $x + y = 60$ and xy^3 is maximum.



PREVIOUS IPE PAPERS

AP - MAY 2024

Time : 3 Hours

JR.PHYSICS

Max.Marks : 60

SECTION-A**I. Answer ALL the following VSAQs:****10 × 2 = 20**

1. What are the fundamental forces in nature ?
2. How can systematic errors be minimised or eliminated?
3. If $\vec{P} = 2\vec{i} + 4\vec{j} + 14\vec{k}$ and $\vec{Q} = 4\vec{i} + 4\vec{j} + 10\vec{k}$ find the magnitude of $\vec{P} + \vec{Q}$.
4. A horse has to exert a greater force during the start of the motion than later. Explain.
5. Mention any two examples that obey Bernoulli's theorem and justify them.
6. Define Viscosity. What are its units and dimensions?
7. Find the increase in temperature of aluminium rod if its length is to be increased by 1%. (α for aluminium = $25 \times 10^{-6}/^{\circ}\text{C}$).
8. State Weins displacement law
9. When does a real gas behave like an ideal gas? **10. Define mean free path.**

SECTION-B**II. Answer any SIX of the following SAQs:****6 × 4 = 24**

11. A car travels the first third of a distance with a speed of 10kmph, the second third at 20kmph and the last third at 60kmph. What is its mean speed over the entire distance?
12. Show that the trajectory of an object thrown at a certain angle with the horizontal is a parabola.
13. Mention the methods used to decrease friction.
14. Define angular velocity(ω). Derive $v=r\omega$.
15. Distinguish between centre of mass and centre of gravity.
16. What is a geostationary satellite? State its uses.
17. Describe the behavior of a wire under gradually increasing load.
18. Pendulum clocks generally go fast in winter and slow in summer. Why?

SECTION-C**III. Answer any TWO of the following LAQs:****2 × 8 = 16**

19. (a) State and prove law of conservation of energy in case of freely falling body.
(b) A machine gun fires 360 bullets per minute and each bullet travels with a velocity of 600 ms^{-1} . If the mass of each bullet is 5gm, find the power of the machine- gun.
20. (a) Define simple harmonic motion. Show that the motion of (point) projection of a particle performing uniform circular motion, on any diameter, is simple harmonic.
(b) On an average a human heart is found to beat 75 times in a minute. Calculate its frequency and period.
21. State second law of thermodynamics. How is heat engine different from a refrigerator.



PREVIOUS IPE PAPERS

AP - MAY 2024

Time : 3 Hours

JR.CHEMISTRY

Max.Marks : 60

SECTION-A**I. Answer ALL questions :****10 × 2 = 20**

1. What is RMS speed?
2. What volume of H₂ at STP is required to reduce 0.795g of CuO to give Cu and H₂O?
3. State the Third Law of Thermodynamics.
4. The equilibrium constant for a reaction is 10. What will be the value of ΔG° ?
R=8.314J K⁻¹ mol⁻¹, T=300K
5. On which factor, the equilibrium constant value changes?
6. What are characteristic colours imparted by IIA elements?
7. What happens when magnesium metal is burnt in air?
8. Greenhouse effect is caused by which gases?
9. What is PAN? What effect is caused by it?
10. Write the conformations of ethane.

SECTION-B**II. Answer any SIX of the following Questions.****6 × 4 = 24**

11. State Fajan's rules and give suitable examples.
12. Define Dipole moment. Write its applications.
13. State and explain Graham's law of diffusion.
14. Balance the following redox reactions by ion-electron method.
 $\text{MnO}_4^- (\text{aq}) + \text{SO}_2 (\text{g}) \rightarrow \text{Mn}^{2+} (\text{aq}) + \text{HSO}_4^- (\text{aq})$ (in acidic solution)
15. Define pH. Calculate the pH of 0.001M NaOH.
16. Explain the removal of hardness of water by ion exchange method.
17. Give two methods of preparation of diborane.
18. Explain the difference in properties of diamond and graphite on the basis of their structure.

SECTION-C**III. Answer any TWO of the following Questions.****2 × 8 = 16**

19. What are the postulates of Bohr's model of hydrogen atom? Discuss the importance of this model to explain various series of line spectra in hydrogen atom.
20. Define IE₁ and IE₂. Why is IE₂ > IE₁ for a given atom? Discuss the factors that effect IE of an element.
21. a) How do we get Benzene from acetylene? Give the corresponding equation.
b) Explain halogenation, alkylation, acylation, nitration & sulphonation.