

Techior Solutions Pvt. Ltd.

HSC Maths I Sample Paper

Total Time: 3 Hr

Total Marks: 80.0

| | | Mathematics I | | | | | |
|--|-------------------------|--|-----|--|--|--|--|
| Section A | | | | | | | |
| MC | Q Single C | forrect | | | | | |
| 1) | Solution | of LPP to minimize $z = 2x + 3y$, such that $x \ge 0$, $y \ge 0$, $1 \le x + 2y \le 10$ is | 1.0 | | | | |
| | A) | x = 0 $y = 1/2$ | | | | | |
| | B) | x = 1/2, y = 0 | | | | | |
| | C) | x = 1, y = 2 | | | | | |
| | D) | x = 1/2, y = 1/2 | | | | | |
| 3) | The dista | nce of the point (3, 4, 5) from the Y-axis is | 1.0 | | | | |
| | A) | 3 | | | | | |
| | B) | 5 | | | | | |
| | C) | $\sqrt{34}$ | | | | | |
| | D) | $\sqrt{41}$ | | | | | |
| 3) If in a triangle, the angles are in A.P. and b: $c = \sqrt{3}: \sqrt{2}$, then A is equal to | | | | | | | |
| | A) | 30° | | | | | |
| | B) | 60° | | | | | |
| | C) | 75° | | | | | |
| | D) | 45° | | | | | |
|) | The volution units, the | me of tetrahedron whose vectices are (1,-6,10), (-1, -3, 7), (5, -1, λ) and (7, -4, 7) is 11 cu n the value of λ is | 1.0 | | | | |
| | A) | 7 | | | | | |
| | B) | 2 | | | | | |
| | C) | 1 | | | | | |
| | D) | 5 | | | | | |
| 5) | If $\sqrt{3}\cos^{3}$ | $x - \sin x = 1$ then general value of x is | 1.0 | | | | |
| | | | | | | | |
| | A) | $2n\pi\pm\frac{3}{3}$ | | | | | |
| | B) | $2n\pi\pm\frac{\pi}{6}$ | | | | | |
| (| C) | $2n\pi \pm \frac{\pi}{3} - \frac{\pi}{6}$ | | | | | |
| | D) | $n\pi + (-1)^n \frac{\pi}{3}$ | | | | | |

6) The angle between the lines 2x = 3y = -z and 6x = -y = -4z is

- **A**) 45°
- **B**) 30°
- **C**) 0°
- **D**) 90°

7) If the sum of two unit vectors is itself a unit vector, then the magnitude of their difference is _____ 1.0

- A) $\sqrt{2}$
- B) $\sqrt{3}$

1

- C)
- **D**) 2
- 8) The line joining the points (2, 1, 8) and (a, b, c) is parallel to the line whose direction ratios are 6, 2, 1.0 3. The value of a, b, c are
 - **A**) 4, 3, 5
 - **B**) 1, 2, $\frac{-13}{2}$
 - **C**) 10, 5, -2
 - **D**) 3, 5, 11
- 9) State whether the expression is meaningful. If not, explain why? If so, state whether it is a vector or 1.0 a scalar:

$$\bar{a}\times\left(\bar{b},\bar{c}\right)$$

10) Write the negation of the following.

 $\sqrt{2}$ is a rational number.

11) State which of the following is the statement. Justify. In case of a statement, state its truth value. 1.0

5 + 4 = 13

12) State whether the following equation has a solution or not?

1.0

1.0

| Section B | | | | | |
|-----------|--|-----|--|--|--|
| Shor | t Description | | | | |
| 13) | Solve each of the following inequations graphically using XY-plane: | 2.0 | | | |
| | $-11x - 55 \le 0$ | | | | |
| 14) | Rewrite the following statement without using if then. | 2.0 | | | |
| | If a man is a judge then he is honest. | | | | |
| 15) | Find the matrix of the co-factor for the following matrix. | 2.0 | | | |
| | $\begin{bmatrix} 1 & 0 & 2 \\ -2 & 1 & 3 \\ 0 & 3 & -5 \end{bmatrix}$ | | | | |
| 16) | Write the negation of the following. | 2.0 | | | |
| | $\forall n \in N, n^2 + n + 2$ is divisible by 4. | | | | |
| 17) | Find the joint equation of the line: | 2.0 | | | |
| | x + y - 3 = 0 and $2x + y - 1 = 0$ | | | | |
| 18) | Rewrite the following statement without using if then. | 2.0 | | | |
| | It $f(2) = 0$ then $f(x)$ is divisible by $(x - 2)$. | | | | |
| 19) | Write the truth value of the following statement: | 2.0 | | | |
| | In $\triangle ABC$ if all sides are equal then its all angles are equal. | | | | |
| 20) | Find the feasible solution of the following in equation: | 2.0 | | | |
| | $3x + 2y \le 18, 2x + y \le 10, x \ge 0, y \ge 0$ | | | | |
| 21) | Write the following compound statement symbolically. | 2.0 | | | |
| | Nagpur is in Maharashtra and Chennai is in Tamil Nadu. | | | | |
| 22) | Find the coordinates of the point which is located in the YZ-plane, one unit to the right of the XZ-plane, and six units above the XY-plane. | 2.0 | | | |
| 23) | Write the truth value of the following. | 2.0 | | | |
| | Milk is white if and only if sky is blue. | | | | |
| 24) | Find the position vector of midpoint M joining the points $L(7, -6, 12)$ and $N(5, 4, -2)$. | 2.0 | | | |

Section C

Medium Description

| 25) | Find the vector equation of the plane which makes equal non zero intercepts on the coordinate axes and passes through $(1, 1, 1)$. | | |
|-----|---|-----|--|
| 26) | Find the centroid of tetrahedron with vertices $K(5, -7, 0)$, $L(1, 5, 3)$, $M(4, -6, 3)$, $N(6, -4, 2)$ | 3.0 | |
| 27) | Using the truth table prove the following logical equivalence. | 3.0 | |
| | $[\sim (p \lor q) \lor (p \lor q)] \land r \equiv r$ | | |
| 28) | If the lines $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $\frac{x-3}{1} = \frac{y-k}{2} = \frac{z}{1}$ intersect each other, then find k. | 3.0 | |
| 29) | Determine whether the following statement pattern is a tautology, contradiction, or contingency: | 3.0 | |
| | $[(p \lor q) \land \sim p] \land \sim q$ | | |
| 30) | Obtain the simple logical expression of the following. Draw the corresponding switching circuit. | 3.0 | |
| | $[p \lor (\sim q) \lor (\sim r)] \land [p \lor (q \land r)]$ | | |
| 31) | Show that $\cos^{-1} \frac{\sqrt{3}}{2} + 2\sin^{-1} \frac{\sqrt{3}}{2} = \frac{5\pi}{6}$ | 3.0 | |
| 32) | Construct the truth table of the following statement pattern. | 3.0 | |
| | $\sim p \wedge [(p \vee \alpha) \wedge \alpha]$ | | |
| 33) | Show that the following equations represent a pair of line: | 30 | |
| 55) | | 5.0 | |
| | $\mathbf{x}^2 - 2\sqrt{3}\mathbf{x}\mathbf{y} - \mathbf{y}^2 = 0$ | | |
| 34) | Find the inverse of the following matrix. | 3.0 | |
| | | | |
| | | | |
| 35) | Show that the following equation represents a pair of line. Find the acute angle between them: | 3.0 | |
| | $2x^2 + xy - y^2 + x + 4y - 3 = 0$ | | |
| 36) | Prove by vector method, that the angle subtended on semicircle is a right angle. | 3.0 | |

Long Description

37) Find the shortest distance between the lines $\mathbf{r} = (4\hat{\mathbf{i}} - \hat{\mathbf{j}}) + \lambda(\hat{\mathbf{i}} + 2\hat{\mathbf{j}} - 3\hat{\mathbf{k}})$ and

$$\mathbf{r} = \left(\hat{\mathbf{i}} - \hat{\mathbf{j}} + 2\widehat{\mathbf{k}}\right) + \mu \left(\hat{\mathbf{i}} + 4\hat{\mathbf{j}} - 5\widehat{\mathbf{k}}\right)$$

38) Prove the following:

$$\sin^{-1}\!\left(rac{3}{5}
ight) + \cos^{-1}\!\left(rac{12}{13}
ight) = \sin^{-1}\!\left(rac{56}{65}
ight)$$

39) Solve the following LPP:

Maximize z = 2x + 3y subject to $x - y \ge 3$, $x \ge 0$, $y \ge 0$.

- 40) An amount of ₹ 5000 is invested in three types of investments, at interest rates 6%, 7%, 8% per annum respectively. The total annual income from these investments is ₹ 350. If the total annual income from the first two investments is ₹ 70 more than the income from the third, find the amount of each investment using matrix method.
- The total cost of 3 T.V. sets and 2 V.C.R.'s is ₹ 35,000. The shopkeeper wants a profit of ₹ 1000 per 4.0 T.V. set and ₹ 500 per V.C.R. He sells 2 T.V. sets and 1 V.C.R. and gets the total revenue as ₹ 21,500. Find the cost price and the selling price of a T.V. set and a V.C.R.
- **42**) Prove the following:

$$an^{-1}igg(rac{1}{2}igg)+ an^{-1}igg(rac{1}{3}igg)=rac{\pi}{4}$$

43) A company produces mixers and food processors. Profit on selling one mixer and one food processor is Rs 2,000 and Rs 3,000 respectively. Both the products are processed through three machines A, B, C. The time required in hours for each product and total time available in hours per week on each machine arc as follows:

| Machine | Mixer | Food Processor | Available time |
|---------|-------|----------------|----------------|
| А | 3 | 3 | 36 |
| В | 5 | 2 | 50 |
| С | 2 | 6 | 60 |

How many mixers and food processors should be produced in order to maximize the profit?

44) A company manufactures bicycles and tricycles each of which must be processed through machines 4.0 A and B. Machine A has maximum of 120 hours available and machine B has maximum of 180 hours available. Manufacturing a bicycle requires 6 hours on machine A and 3 hours on machine B. Manufacturing a tricycle requires 4 hours on machine A and 10 hours on machine B. If profits are Rs. 180 for a bicycle and Rs. 220 for a tricycle, formulate and solve the L.P.P. to determine the number of bicycles and tricycles that should be manufactured in order to maximize the profit.

4.0

4.0

4.0

4.0

4.0