Part - III

MATHEMATICS

(Telugu & English Versions)

Instructions:
(1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.
(2) Use Blue or Black ink to write and underline and pencil to draw diagrams.

Note:
This question paper contains four sections.
1. \( f(x) = x^2 + 5 \), then \( f(-4) = \)
   (a) 26 (b) 21 (c) 20 (d) 0

If \( f(x) = x^2 + 5 \), then \( f(-4) = \)
   (a) 26 (b) 21 (c) 20 (d) 0

2. \( k + 2, 4k - 6, 3k - 2 \) are in AP. Then \( k \) is:
   (a) 2 (b) 3 (c) 4 (d) 5

If \( k + 2, 4k - 6, 3k - 2 \) are the three consecutive terms of an A.P., then the value of \( k \) is:
   (a) 2 (b) 3 (c) 4 (d) 5

3. If \( k + 2, 4k - 6, 3k - 2 \) are the three consecutive terms of an A.P., then the value of \( k \) is:
   (a) 8 (b) \( \frac{1}{16} \) (c) \( \frac{1}{32} \) (d) 16

If the product of the first four consecutive terms of a G.P. is 256 and if the common ratio is 4 and the first term is positive, then its 3rd term is:
   (a) 8 (b) \( \frac{1}{16} \) (c) \( \frac{1}{32} \) (d) 16

4. \( x^2 - 2x + 7 \) and \( x + 4 \) are divisible by \( x - 2 \) and \( x + 2 \) respectively:
   (a) 28 (b) 29 (c) 30 (d) 31

The remainder when \( x^2 - 2x + 7 \) is divided by \( x + 4 \) is:
   (a) 28 (b) 29 (c) 30 (d) 31

5. \( x^2 - bx + c = 0 \) and \( x^2 + bx - a = 0 \) are divisible by \( x - 2 \) and \( x + 2 \) respectively:
   (a) \( \frac{c + a}{2b} \) (b) \( \frac{c - a}{2b} \) (c) \( \frac{c + b}{2a} \) (d) \( \frac{a + b}{2c} \)

The common root of the equations \( x^2 - bx + c = 0 \) and \( x^2 + bx - a = 0 \) is:
   (a) \( \frac{c + a}{2b} \) (b) \( \frac{c - a}{2b} \) (c) \( \frac{c + b}{2a} \) (d) \( \frac{a + b}{2c} \)
6. \[ A = \begin{pmatrix} 7 & 2 \\ 1 & 3 \end{pmatrix} \] \[ A + B = \begin{pmatrix} -1 & 0 \\ 2 & -4 \end{pmatrix} \] \[ \text{Therefore} \ B = \begin{pmatrix} \_ & \_ \\ \_ & \_ \end{pmatrix} \]

(a) \[ \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \]  
(b) \[ \begin{pmatrix} 6 & 2 \\ 3 & -1 \end{pmatrix} \]  
(c) \[ \begin{pmatrix} -8 & -2 \\ 1 & -7 \end{pmatrix} \]  
(d) \[ \begin{pmatrix} 8 & 2 \\ -1 & 7 \end{pmatrix} \]

If \( A = \begin{pmatrix} 7 & 2 \\ 1 & 3 \end{pmatrix} \) and \( A + B = \begin{pmatrix} -1 & 0 \\ 2 & -4 \end{pmatrix} \), then the matrix \( B = \begin{pmatrix} \_ & \_ \\ \_ & \_ \end{pmatrix} \)

(a) \[ \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \]  
(b) \[ \begin{pmatrix} 6 & 2 \\ 3 & -1 \end{pmatrix} \]  
(c) \[ \begin{pmatrix} -8 & -2 \\ 1 & -7 \end{pmatrix} \]  
(d) \[ \begin{pmatrix} 8 & 2 \\ -1 & 7 \end{pmatrix} \]

7. \((-2, 6), (4, 8)\) \[ \text{Slope of the straight line which is perpendicular to the straight line joining the points} \ (-2, 6) \text{ and } (4, 8) \text{ is equal to:} \]

(a) \[ \frac{1}{3} \]  
(b) \[ 3 \]  
(c) \[ -3 \]  
(d) \[ -\frac{1}{3} \]

8. \((2, 5), (4, 6), (a, a)\) \[ \text{If the points} (2, 5), (4, 6) \text{ and} (a, a) \text{ are collinear, then the value of} 'a' \text{ is equal to:} \]

(a) \[ -8 \]  
(b) \[ 4 \]  
(c) \[ -4 \]  
(d) \[ 8 \]

9. \[ \text{The perimeters of two similar triangles are 24 cm and 18 cm respectively. If one side of the first triangle is 8 cm, then the corresponding side of the other triangle is:} \]

(a) \[ 4 \] cm  
(b) \[ 3 \] cm  
(c) \[ 9 \] cm  
(d) \[ 6 \] cm
10. \( \triangle ABC \) is a right-angled triangle where \( \angle B = 90^\circ \) and \( \overline{BD} \perp \overline{AC} \). If \( \overline{BD} = 8 \) cm, \( \overline{AD} = 4 \) cm, then \( \overline{CD} \) is:

(a) 24 cm  
(b) 16 cm  
(c) 32 cm  
(d) 8 cm

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(a) 24 cm  
(b) 16 cm  
(c) 32 cm  
(d) 8 cm

11. \( \angle ABC = \)

(a) 45°  
(b) 30°  
(c) 60°  
(d) 50°

In the adjoining figure \( \angle ABC = \)

(a) 45°  
(b) 30°  
(c) 60°  
(d) 50°

12. \( 9 \tan^2 \theta - 9 \sec^2 \theta = \)

(a) 1  
(b) 0  
(c) 9  
(d) –9

\( 9 \tan^2 \theta - 9 \sec^2 \theta = \)

(a) 1  
(b) 0  
(c) 9  
(d) –9
13. If the surface area of a sphere is \(100 \pi \text{ cm}^2\), then its radius is equal to:

(a) 25 cm  (b) 100 cm  (c) 5 cm  (d) 10 cm

14. Standard deviation of a collection of data is \(2\sqrt{2}\). If each value is multiplied by 3, then the standard deviation of the new data is:

(a) \(\sqrt{12}\)  (b) \(4\sqrt{2}\)  (c) \(6\sqrt{2}\)  (d) \(9\sqrt{2}\)

15. A card is drawn from a pack of 52 cards at random. The probability of getting neither an ace nor a king card is:

(a) \(\frac{2}{13}\)  (b) \(\frac{11}{13}\)  (c) \(\frac{4}{13}\)  (d) \(\frac{8}{13}\)
16. \( A = \{1, 2, 3, 4, 5\}, B = \{3, 4, 5, 6\} \) \( \text{and} \ C = \{5, 6, 7, 8\} \) \( \Rightarrow \) \( A \cup (B \cup C) = (A \cup B) \cup C \) \( \text{holds} \).

Given, \( A = \{1, 2, 3, 4, 5\}, B = \{3, 4, 5, 6\} \) and \( C = \{5, 6, 7, 8\} \), show that \( A \cup (B \cup C) = (A \cup B) \cup C \).

17. \( A = \{5, 6, 8, 10\} \) \( B = \{19, 15, 9, 11\} \) \( \Rightarrow \) \( \text{and} \ f(x) = 2x - 1 \).

\( a \) \( \text{and} \ b \) \( \text{are in G.P.} \) \( \text{find} \) \( m \).

<table>
<thead>
<tr>
<th>( x )</th>
<th>5</th>
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<th>8</th>
<th>10</th>
</tr>
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<td>a</td>
<td>11</td>
<td>b</td>
<td>19</td>
</tr>
</tbody>
</table>

The following table represents a function from \( A = \{5, 6, 8, 10\} \) to \( B = \{19, 15, 9, 11\} \) where \( f(x) = 2x - 1 \). Find the values of \( a \) and \( b \).

<table>
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</tr>
</tbody>
</table>

18. \( \frac{2}{7}, m, \frac{7}{2}(m + 2) \) \( \text{are in G.P.} \) \( \text{find} \) \( m \).

If \( \frac{2}{7}, m, \frac{7}{2}(m + 2) \) are in G.P., find the values of \( m \).
19. Solve by elimination method: \(13x + 11y = 70, 11x + 13y = 74\).

20. Simplify: \(\frac{6x^2 + 9x}{3x^2 - 12x}\)

21. Construct a \(2 \times 2\) matrix \(A = [a_{ij}]\) whose elements are given by \(a_{ij} = 2i - j\).

22. Let \(A = \begin{pmatrix} 3 & 2 \\ 5 & 1 \end{pmatrix}\) and \(B = \begin{pmatrix} 8 & -1 \\ 4 & 3 \end{pmatrix}\). Find the matrix \(C\), if \(C = 2A + B\).

23. Find the coordinates of the point which divides the line segment joining \((-3, 5)\) and \((4, -9)\) in the ratio 1 : 6 internally.

24. “The points \((0, a), a > 0\) lie on x-axis for all \(a\)”. Justify the truthness of the statement.

25. In \(\triangle PQR\), \(AB \parallel QR\). If \(AB = 3\) cm, \(PB = 2\) cm and \(PR = 6\) cm, then find the length of \(QR\).
26. The angle of elevation of the top of a tower as seen by an observer is $30^\circ$. The observer is at a distance of $30\sqrt{3}$ m from the tower. If the eye level of the observer is 1.5 m above the ground level, then find the height of the tower.

27. The total surface area of a solid right circular cylinder is 1540 $\text{cm}^2$. If the height is four times the radius of the base, then find the height of the cylinder.

28. The smallest value of a collection of data is 12 and the range is 59. Find the largest value of the collection of data.

29. In tossing a fair coin twice, find the probability of getting:
   (i) Two heads
   (ii) Exactly one tail

30. (a) If the volume of a solid sphere is $7241\frac{1}{7}$ cu. cm, then find its radius. 

   (b) $x = a \sec \theta + b \tan \theta$ and $y = a \tan \theta + b \sec \theta$, then prove that $x^2 - y^2 = a^2 - b^2$. 

   OR

(a) If $x = a \sec \theta + b \tan \theta$ and $y = a \tan \theta + b \sec \theta$, then prove that $x^2 - y^2 = a^2 - b^2$. 

(b) If the volume of a solid sphere is $7241\frac{1}{7}$ cu. cm, then find its radius. 

   (Take $\pi = \frac{22}{7}$)
Section - III

(i) Answer 9 questions.

(ii) Question number 45 is compulsory. Select any 8 questions from the 14 questions.

31. A = {a, b, c, d, e, f, g, x, y, z}, B = {1, 2, c, d, e} and C = {d, e, f, g, 2, y}.
   Verify \( A \setminus (B \cup C) = (A \setminus B) \cap (A \setminus C) \).

32. A = {6, 9, 15, 18, 21}; B = {1, 2, 4, 5, 6} and \( f: A \to B \) is defined by \( f(x) = \frac{x-3}{3} \).
   Represent \( f \) by:
   (i) an arrow diagram
   (ii) a set of ordered pairs
   (iii) a table
   (iv) a graph

33. \( 1^2 - 2^2 + 3^2 - 4^2 + \ldots \) find the sum of the first \( 2n \) terms of the series.

34. \( 7 + 77 + 777 + \ldots \) find the sum of first \( n \) terms of the series.
35. The speed of a boat in still water is 15 km/hr. It goes 30 km upstream and return downsteam to the original point in 4 hrs. 30 minutes. Find the speed of the stream.

36. $16x^4 - 24x^3 + (a-1)x^2 + (b+1)x + 49$ is a perfect square. Find the values of a and b.

37. Let $A = \begin{pmatrix} 5 \\ 2 \\ 3 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & -1 \\ -1 & 1 \end{pmatrix}$. Show that $(AB)^T = B^T A^T$.

38. Find the area of the quadrilateral formed by the points $(-4, -2), (-3, -5), (3, -2), (2, 3)$.


40. A flag post stands on the top of a building. From a point on the ground, the angles of elevation of the top and bottom of the flag post are $60^\circ$ and $45^\circ$ respectively. If the height of the flag post is 10 m, find the height of the building.
41. The perimeter of the ends of a frustum of a cone are 44 cm and 8.4 $\pi$ cm. If the depth is 14 cm, then find its volume.

The perimeter of the ends of a frustum of a cone are 44 cm and 8.4 $\pi$ cm. If the depth is 14 cm, then find its volume.

42. The length, breadth and height of a solid metallic cuboid are 44 cm, 21 cm and 12 cm respectively. It is melted and a solid cone is made out of it. If the height of the cone is 24 cm, then find the diameter of its base.

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43. Find the coefficient of variation of the following data.

18, 20, 15, 12, 25

44. If a die is rolled twice, find the probability of getting an even number in the first time or a total of 8.

If a die is rolled twice, find the probability of getting an even number in the first time or a total of 8.

45. (a) Find the GCD of the following polynomials $3x^4 + 6x^3 - 12x^2 - 24x$ and $4x^4 + 14x^3 + 8x^2 - 8x$.

(b) A straight line cuts the coordinate axes at A and B. If the mid point of AB is (3, 2), then find the equation of AB.
Note: Answer both the questions choosing either of the alternative. 2x10=20

46. (a) Draw the two tangents from a point which is 10 cm away from the centre of a circle of radius 6 cm. Also, measure the lengths of the tangents.

OR

(b) Construct a cyclic quadrilateral ABCD, given AB = 6 cm, ∠ABC = 70°, BC = 5 cm and ∠ACD = 30°.

47. (a) Solve graphically $2x^2 + x - 6 = 0$.

OR

(b) Draw the graph of $xy = 20$, $x, y > 0$. Use the graph to find $y$ when $x = 5$, and to find $x$ when $y = 10$. 

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