Part - III

MATHEMATICS

(Maximum Marks : 100)

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.

SECTION - 1

(Marks : 15)

Part A

(i) Answer all the 15 questions.
(ii) Choose the correct answer from the given four alternatives and write the option code and the corresponding answer.

[Turn over]
1. \( f(x) = x^2 + 5 \) \( \Rightarrow f(-4) = \)  
(a) 26  (b) 21  (c) 20  (d) −20  
If \( f(x) = x^2 + 5 \), then \( f(-4) = \)  
(a) 26  (b) 21  (c) 20  (d) −20

2. \( k + 2, 4k - 6, 3k - 2 \) \( \Rightarrow \) A.P.  
(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. \( \text{A.P.} \)  
(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, then the value of the first term is :  
(a) 8  (b) \( \frac{1}{16} \)  (c) \( \frac{1}{32} \)  (d) 16

4. \( x^2 - 2x + 7 \) \( \text{and} \ x + 4 \) \( \Rightarrow \)  
(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. \( x^2 - bx + c = 0, \ x^2 + bx - a = 0 \) \( \Rightarrow \)  
(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. \[ A = \begin{pmatrix} 7 & 2 \\ 1 & 3 \end{pmatrix}, \quad A + B = \begin{pmatrix} -1 & 0 \\ 2 & -4 \end{pmatrix} \] 

Find the matrix \( B = \) 

(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 \( B = \) 

(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. \(-2, 6\), \((4, 8)\) दो बिंदुओं के बीच स्थित रेखा की लंबाई के अनुपात \(a\) के बराबर है 

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

Slope of the straight line which is perpendicular to the straight line joining the points \((-2, 6)\) and \((4, 8)\) is equal to : 

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

8. \((2, 5), (4, 6), (a, a)\) दो बिंदुओं के बीच रेखा की लंबाई के अनुपात \(a\) के बराबर है 

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

If the points \((2, 5), (4, 6)\) and \((a, a)\) are collinear, then the value of \(a\) is equal to : 

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

9. \((2, 5), (4, 6), (a, a)\) दो बिंदुओं के बीच रेखा की लंबाई के अनुपात \(a\) के बराबर है 

(a) \[ 4 \]  
(b) \[ 3 \]  
(c) \[ 9 \]  
(d) \[ 6 \]  

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) \[ 4 \text{ cm} \]  
(b) \[ 3 \text{ cm} \]  
(c) \[ 9 \text{ cm} \]  
(d) \[ 6 \text{ cm} \]  

[ Turn over
10. \( \angle B = 90^\circ \) - പന്ത് വായുക്കുന്നതിന് \( \triangle ABC \) - പന്ത് \( BD \perp AC \) കാണുന്നു. \( BD = 8 \) സെ.മി., \( AD = 4 \) സെ.മി. എങ്കിൽ \( CD = \)

(a) 24 സെ.മി. (b) 16 സെ.മി. (c) 32 സെ.മി. (d) 8 സെ.മി.

\( \triangle ABC \) ഒരു വട്ടമാണിത്തിരി കാണുന്നു \( \angle B = 90^\circ \) എന്നിവ കാണുന്നു. \( BD = 8 \) സെ.മി., \( AD = 4 \) സെ.മി.,

then \( CD = \)

(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. The surface area of a sphere is \(100 \pi \text{ cm}^2\). Find its radius:

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

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. The standard deviation of a collection of data is \(2\sqrt{2}\). If each value is multiplied by 3, what is the standard deviation of the new data?

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

Standard deviation of a collection of a 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) \(\frac{8}{13}\)

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) \(\frac{8}{13}\)
നിലവില്‍ - II / SECTION - II

(മെഴിവ് : 20) / (Marks : 20)

ക്വിസിന്‍ : (i) 10 സമാന്തരാഭിനിപ്പിക്കുന്ന സമവാക്യങ്ങള്‍.
(ii) 30-വാലാം ക്വിസിന്‍ സമാന്തരാഭിനിപ്പിക്കുന്ന സമവാക്യങ്ങള്‍. ഭാഗത്തിന്‍ 14 സ്മരിതമായി നല്‍കിയിരുന്നത് 9 സമാന്തരാഭിനിപ്പിക്കുന്ന സമവാക്യങ്ങള്‍.

Note : (i) Answer 10 questions.
(ii) Question number 30 is compulsory. Select any 9 questions from the first 14 questions.

16. A = {1, 2, 3, 4, 5}, B = {3, 4, 5, 6}, C = {5, 6, 7, 8} അന്തരിത പ്രതിക്ഷേപിക്കുന്നത് A ∪ (B ∪ C) = (A ∪ B) ∪ C പ്രതിക്ഷേപിക്കുന്നു.

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

17. വ്യാപകമായും പ്രതിക്ഷേപിക്കുന്ന പ്രതിക്ഷേപിക്കുന്ന A = {5, 6, 8, 10} - അന്തരിത B = {19, 15, 9, 11} - പ്രതിക്ഷേപിക്കുന്ന മാത്രം f(x) = 2x − 1 അന്തരിത പ്രതിക്ഷേപിക്കുന്നു. അതെത്ത് a, b - അന്തരിത അന്തരിത പ്രതിക്ഷേപിക്കുന്ന മാത്രം പ്രതിക്ഷേപിക്കുന്നു?

<table>
<thead>
<tr>
<th>x</th>
<th>5</th>
<th>6</th>
<th>8</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>f(x)</td>
<td>a</td>
<td>b</td>
<td>11</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.

18. $-rac{2}{7}, m, -rac{7}{2}(m + 2)$ അന്തരിത പ്രതിക്ഷേപിക്കുന്ന (G.P.) അന്തരിത പ്രതിക്ഷേപിക്കുന്ന m - അന്തരിത അന്തരിത ഭാഗത്തിന്‍

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

Solve by elimination method: \(13x + 11y = 70, \quad 11x + 13y = 74\).

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

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

21. Let \(a_{ij} = 2i - j\) and \(A = [a_{ij}]\) be a \(2 \times 2\) matrix.

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

22. \(A = \begin{pmatrix} 3 & 2 \\ 5 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 8 & -1 \\ 4 & 3 \end{pmatrix}, \quad C = 2A + B\)

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. Let \((-3, 5)\) and \((4, -9)\) be the coordinates of two points on the line segment in the ratio 1 : 6 internally.

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 the x-axis for all \(a\)". Justify the truthness of the statement.

25. \(\Delta PQR\) is \(A, B\) \(P\) \(Q, \quad PR\) \(AB\) \(\parallel QR\). \(AB = 3\) \(\text{cm}\), \(PB = 2\) \(\text{cm}\), \(PR = 6\) \(\text{cm}\), \(QR = 4\) \(\text{cm}\) \(\parallel QR\) \(\text{cm}\) \(\text{cm}\).

In \(\Delta PQR\), \(AB \parallel QR\). If \(AB\) is 3 cm, \(PB\) is 2 cm and \(PR\) is 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°. 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 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. \((\text{Take } \pi = \frac{22}{7})\)

(b) If \(x = a \sec \theta + b \tan \theta\) and \(y = a \tan \theta + b \sec \theta\), then prove that \(x^2 - y^2 = a^2 - b^2\).
31. Let \( A = \{a, b, c, d, e, f, g, x, y, z\} \), \( B = \{1, 2, c, d, e\} \), \( C = \{d, e, f, g, 2, y\} \). Verify \( A \setminus (B \cup C) = (A \setminus B) \cap (A \setminus C) \).

32. Let \( A = \{6, 9, 15, 18, 21\} \); \( B = \{1, 2, 4, 5, 6\} \) and \( f : A \rightarrow B \) be 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. Find the sum of the first 2n terms of the series \( 1^2 - 2^2 + 3^2 - 4^2 + \ldots \).

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

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

37. \(A = \begin{pmatrix} 5 & 2 \\ 7 & 3 \end{pmatrix}, \quad B = \begin{pmatrix} 2 & -1 \\ -1 & 1 \end{pmatrix}\) verify 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° and 45° respectively. If the height of the flag post is 10 m, find the height of the building. \((\sqrt{3} = 1.732)\)
41. The perimeter of the ends of a frustum of a cone are 44 cm and 8.4 \pi \text{ 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.

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.

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

(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.

[ Turn over }
SECTION - IV

Note: Answer both the questions choosing either of the alternative.

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

(b) \(AB = 6 \text{ cm}, \angle ABC = 70^\circ, BC = 5 \text{ cm}, \angle ACD = 30^\circ\). Construct a cyclic quadrilateral \(ABCD\).

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

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