Do not open this Question Booklet until you are asked to do so.

Read carefully all the instructions given at the back page and on the front page of this Question Booklet.

This Booklet contains 32 printed pages.

EXAMINATION—STPGT
SUBJECT : MATHEMATICS

Instructions for Candidates

1. Use Black Ballpoint Pen only for writing particulars of this Question Booklet and marking responses on the OMR Answer Sheet.

2. This test is of 2 hours and 30 minutes duration and consists of 75 MCQ-type questions. Each question carries 2 marks.

3. There is no negative marking for any wrong answer.

4. Rough work should be done only in the space provided in the Question Booklet.

5. The answers are to be marked on the OMR Answer Sheet only. Mark your responses carefully since there is no chance of alteration/correction.

6. Use of eraser or whitener is strictly prohibited.

7. Candidates should note that each question is given in bilingual form (English and Bengali). In case of any discrepancy or confusion in the medium/version, the English Version will be treated as the authentic version.

Name of the Candidate (in Capitals) : ________________________

OMR Answer Sheet No. ________________________

Signature of the Candidate with date

Signature of the Invigilator with date

Full Signature of the Candidate with date

OMR Answer Sheet No. ________________________

Signature of the Invigilator with date

Full Signature of the Candidate with date
Direction: Answer the following questions by selecting the correct option.

1. If $A = \{2, 3, 5, 7\}$, then the correct statement is
   
   (A) $2 \subset A$
   
   (B) $\{2\} \in A$
   
   (C) $\{2\} \subseteq A$
   
   (D) $2 \in A$

2. $X$ and $Y$ are two sets such that $X \cup Y$ has 18 elements. If $X$ has 15 elements and $Y$ has 8 elements, then the number of elements in $X \cap Y$ will be
   
   (A) 5  
   
   (B) 8  
   
   (C) 7  
   
   (D) 3

3. If $P = \{5m : m \in N\}$ and $Q = \{5^n : n \in N\}$
   
   where $N$ is the set of natural numbers, then
   
   (A) $Q \subset P$
   
   (B) $P \subset Q$
   
   (C) $P = Q$
   
   (D) $P \cup Q = N$
4. The values of $x$, for which the functions $f(x) = x$, $g(x) = (\sqrt{x})^2$ and $h(x) = \frac{x^2}{x}$ are identical, are

(A) $0 \leq x$

(B) $0 < x$

(C) all real values

(D) all real values except 0

5. Study the given statements carefully and select the correct option:

Statement–I:
The function $f : N \to N$ defined by $f(x) = x^2$, $x \in N$; $N$ is a set of natural numbers, is a one-one mapping.

Statement–II:
The function $f : N \to N$ defined by $f(x) = \frac{1}{2}x$, $x \in N$; where $N$ is the set of natural numbers, is not a mapping.

(A) Both Statement–I and Statement–II are true

(B) Both Statement–I and Statement–II are false

(C) Statement–I is true but Statement–II is false

(D) Statement–I is false but Statement–II is true
6. Let $A = \{2, 3, 4, 5\}$ and
\[ R = \{(2, 2), (3, 3), (4, 4), (5, 5),
(2, 3), (3, 2), (3, 5), (5, 3)\} \]
be a relation in $A$. Then $R$ is
(A) reflexive and transitive
(B) reflexive and symmetric
(C) symmetric and transitive
(D) None of the above

7. If $S$ is a set of even integers and $*$ is the usual multiplication, then
(A) $(S, *)$ is a group
(B) $(S, *)$ is a monoid but not group
(C) $(S, *)$ is a semigroup
(D) None of the above

8. The identity element of the group $(I, #)$, where $I$ is the set of all integers and the binary operation $#$ defined by $a # b = a + b + 1$, $a, b \in I$ is
(A) 0
(B) 1
(C) −1
(D) 2
9. If
\[ x + iy = \frac{a + ib}{\sqrt{c + id}} \]
then \((x^2 + y^2)^2\) is equal to

(A) \(\frac{a^2 + b^2}{c^2 + d^2}\)

(B) \(\frac{a^2 - b^2}{c^2 + d^2}\)

(C) \(\frac{a^2 - b^2}{c^2 - d^2}\)

(D) \(\frac{(a-b)(c-d)}{(a+b)(c+d)}\)

10. If \(x\) satisfies the equation
\[ x^2 - 2x\cos \theta + 1 = 0 \]
then the value of \(x^n + \frac{1}{x^n}\) is

(A) \(2^n \cos n\theta\)

(B) \(2^n \cos^n \theta\)

(C) \(2\cos n\theta\)

(D) \(2\cos^n \theta\)
11. For the equation 
\[
\frac{1}{x + a} - \frac{1}{x + b} = \frac{1}{x + c}
\]
if the product of the roots is 0, then the sum of the roots is 
(A) 0
(B) \(\frac{2ab}{b+c}\)
(C) \(\frac{2bc}{b+c}\)
(D) \(-\frac{2bc}{b+c}\)

12. Given \(x > y\) and \(z \neq 0\); \(x, y, z\) are any real numbers. The inequality which is not always true is 
(A) \(x + z > y + z\)
(B) \(xy > yz\)
(C) \(xz^2 > yz^2\)
(D) \((x - z) > (y - z)\)

13. The values of \(m\) for which 
\[
m^3 + 1 \geq m(m + 1)
\]
are given by 
(A) \(-1 \leq m \leq 1\)
(B) \(m \geq 0\)
(C) \(m \geq -1\)
(D) \(m \leq 0\)
14. Four different trains run from Agartala to Dharmanagar in every morning. The number of ways in which 10 daily passengers can travel from Agartala to Dharmanagar is

(A) 40
(B) $^{10}P_4$
(C) $10^4$
(D) $4^{10}$

15. The value of
\[ \binom{7}{0} + \binom{7}{1} + \binom{7}{1} + \binom{7}{2} + \cdots + \binom{7}{6} + \binom{7}{7} \]
is

(A) $2^7 - 1$
(B) $2^8 - 2$
(C) $2^8 - 1$
(D) $2^8$

16. The term independent of $x$ in the expansion of $(x^{1/6} - x^{-1/3})^9$ is

(A) $-84$
(B) $-0.84$
(C) $8.4$
(D) $84$
17. The middle-term in the expansion of \( \left( x + \frac{1}{x} \right)^{10} \)
is
(A) \( 10 \binom{6}{1} \frac{1}{x} \)
(B) \( 10 \binom{5}{1} \)
(C) \( 10 \binom{6}{1} \)
(D) \( 10 \binom{7}{1} x^4 \)

18. The product of the two series
\( \left( 1 + \frac{1}{1} + \frac{1}{2} + \ldots \right) \)
and \( \left( 1 - \frac{1}{1} + \frac{1}{2} - \frac{1}{3} + \ldots \right) \)
is
(A) 1  (B) \( e^{-2} \)
(C) \( -e^2 \)  (D) \(-1 \)

19. If \( s, r, t \) are in AP as well as in GP, then
(A) \( s = r \neq t \)
(B) \( s \neq r = t \)
(C) \( s \neq r \neq t \)
(D) \( s = r = t \)
20. Match the Column—I with Column—II and select the correct option from the codes given below:

<table>
<thead>
<tr>
<th>Column—I</th>
<th>Column—II</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. {-n^2}; n \in N</td>
<td>1. Finitely oscillating sequence</td>
</tr>
<tr>
<td>b. {(-1)^n n}; n \in N</td>
<td>2. Monotone decreasing sequence</td>
</tr>
<tr>
<td>c. {1+(-1)^n}; n \in N</td>
<td>3. Bounded above but not bounded below</td>
</tr>
<tr>
<td>d. {\frac{1}{n}}; n \in N</td>
<td>4. Neither bounded above nor bounded below</td>
</tr>
</tbody>
</table>

Codes:

(A) a b c d 
1 2 3 4

(B) a b c d 
3 1 4 2

(C) a b c d 
3 4 1 2

(D) a b c d 
3 4 2 1

21. The value of

\[11^2 + 12^2 + 13^2 + \cdots + 20^2\]

is

(A) 2481

(B) 2483

(C) 2485

(D) 2487

21. \[11^2 + 12^2 + 13^2 + \cdots + 20^2\] -এর মান হল

(A) 2481

(B) 2483

(C) 2485

(D) 2487
22. For a non-zero real number \( \lambda \), if

\[
\begin{vmatrix}
  a & b & a\lambda + b \\
  b & c & b\lambda + c \\
  a\lambda + b & b\lambda + c & 0
\end{vmatrix} = 0
\]

then \( a, b, c \) are in

(A) arithmetic progression
(B) geometric progression
(C) harmonic progression
(D) None of the above

23. If every element of a third-order determinant of value \( \Delta \) is multiplied by 3, then the new determinant will be

(A) \( \Delta \)
(B) \( 3\Delta \)
(C) \( 9\Delta \)
(D) \( 27\Delta \)

24. If \( I_n \) is the unit matrix of order \( n \), then \( (I_n)^{-1} \) is equal to

(A) 0
(B) \( I_n \)
(C) \( nI_n \)
(D) None of the above
25. The value of $x$ for which the matrix product of
\[
\begin{bmatrix}
2 & 0 & 7 \\
0 & 1 & 0 \\
1 & -2 & 1
\end{bmatrix}
\begin{bmatrix}
-x & 14x & 7x \\
0 & 1 & 0 \\
x & -4x & -2x
\end{bmatrix}
\]
equals an identity matrix, is
(A) $\frac{1}{2}$
(B) $\frac{1}{3}$
(C) $\frac{1}{4}$
(D) $\frac{1}{5}$

26. If $f(x) = \cos^2 x + \sec^2 x$, then
(A) $f(x) < 1$
(B) $f(x) = 1$
(C) $2 > f(x) > 1$
(D) $f(x) \geq 2$
27. If \( \sin A = \sin B \) and \( \cos A = \cos B \), then

(A) \( \sin \frac{1}{2}(A - B) = 0 \)
(B) \( \sin \frac{1}{2}(A + B) = 0 \)
(C) \( \cos \frac{1}{2}(A - B) = 0 \)
(D) \( \cos \frac{1}{2}(A + B) = 0 \)

28. The value of \( \sin^{-1} \cos(\sin^{-1} x) + \cos^{-1} \sin(\cos^{-1} x) \)

is

(A) 0
(B) \( \frac{\pi}{4} \)
(C) \( \frac{\pi}{2} \)
(D) \( \pi \)

29. If \( \cos^{-1} x + \cos^{-1} y = \cos^{-1} z \), then \( x^2 + y^2 + z^2 \) will be

(A) 1
(B) \( 2xyz + 1 \)
(C) \( 2xyz - 1 \)
(D) \( 1 - 2xy \)
30. If \( A = \sin 57^\circ - \sin 1^\circ \), then
   
   (A) \( A < 0 \)
   
   (B) \( A = 0 \)
   
   (C) \( A > 0 \)
   
   (D) \( A = 1 \)

31. If
\[
\sin \theta + \sqrt{\sin \theta + \sqrt{\sin \theta + \sqrt{\sin \theta + \cdots}}} = \sec^4 \alpha,
\]
then \( \sin \theta \) is equal to
   
   (A) \( \sec^2 \alpha \)
   
   (B) \( \tan^2 \alpha \)
   
   (C) \( \sec^2 \alpha \tan^2 \alpha \)
   
   (D) \( \cos^2 \alpha \)

32. Let
\[
f(x) = \begin{cases} 
3x - 4, & \text{for } 0 \leq x \leq 2 \\
2x + \lambda, & \text{for } 2 < x \leq 3 
\end{cases}
\]
If \( f(x) \) is continuous at \( x = 2 \), then \( \lambda \) is
   
   (A) \(-1\)
   
   (B) \(-2\)
   
   (C) \(0\)
   
   (D) \(2\)
33. If \( n \) is a positive integer, then the value of
\[
l\lim_{x \to \infty} \frac{x^n + a_1 x^{n-1} + \cdots + a_n}{x^n + b_1 x^{n-1} + \cdots + b_n}
\]
is
(A) 1
(B) \( \frac{a_n}{b_n} \)
(C) 0
(D) None of the above

34. The equation of normal at the point \((l, 1)\) on the curve \(2y = 3 - x^2\) is
(A) \( x + y = 0 \)
(B) \( x + y + 1 = 0 \)
(C) \( x - y + 1 = 0 \)
(D) \( x - y = 0 \)

35. Let
\[
f(b) - f(a) = (b - a)f'(x_1); \ a < x_1 < b
\]
If \( f(x) = \frac{1}{x} \), then \( x_1 \) is
(A) \( \sqrt{ab} \)
(B) \( \frac{a + b}{2} \)
(C) \( \frac{2ab}{a + b} \)
(D) \( \frac{b - a}{b + a} \)

33. যদি \( n \) একটি ধনাত্মক অংক হয়, তাহলে
\[
l\lim_{x \to \infty} \frac{x^n + a_1 x^{n-1} + \cdots + a_n}{x^n + b_1 x^{n-1} + \cdots + b_n}
\]
-এর মান হবে
(A) 1
(B) \( \frac{a_n}{b_n} \)
(C) 0
(D) উপরের কোনটিই নয়

34. \((l, 1)\) বিন্দুতে \(2y = 3 - x^2\) বক্রের অভিলম্বের সমীকরণটি হল
(A) \( x + y = 0 \)
(B) \( x + y + 1 = 0 \)
(C) \( x - y + 1 = 0 \)
(D) \( x - y = 0 \)

35. ধরা যাক,
\[
f(b) - f(a) = (b - a)f'(x_1); \ a < x_1 < b
\]
যদি \( f(x) = \frac{1}{x} \) হয়, তাহলে \( x_1 \)-এর মান হল
(A) \( \sqrt{ab} \)
(B) \( \frac{a + b}{2} \)
(C) \( \frac{2ab}{a + b} \)
(D) \( \frac{b - a}{b + a} \)
36. If \( f(x + y) = f(x)f(y) \) and \( f(5) = 2 \), 
\( f'(0) = 3 \), for all real numbers \( x \) and 
\( y \); then the value of \( f'(5) \) is 

(A) 2 
(B) 3 
(C) 4 
(D) 6 

37. If \( x + y = 3 \), then the maximum value 
of the function \( \frac{9}{x} + \frac{36}{y} \) is 

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

38. The value of 
\[ \int_{-1/2}^{1/2} \cos x \log \frac{1+x}{1-x} \, dx \] 
is equal to 

(A) \( \log 3 \) 
(B) \( \cos 1 \log 2 \) 
(C) 0 
(D) 1
39. \[
\lim_{n \to \infty} \left[ \frac{1}{\sqrt{n^2 - 1^2}} + \frac{1}{\sqrt{n^2 - 2^2}} + \ldots + \frac{1}{\sqrt{(2n-1)}} \right]
\]

is equal to

(A) \( \frac{\pi}{4} \)

(B) \( \frac{\pi}{2} \)

(C) \( \pi \)

(D) \( 2\pi \)

40. If

\[ I_1 = \int_{x}^{1} \frac{dt}{1+t^2} \quad \text{and} \quad I_2 = \int_{1/x}^{1} \frac{dt}{1+t^2} \]

for \( x > 0 \), then

(A) \( I_1 = I_2 \)

(B) \( I_1 > I_2 \)

(C) \( I_2 > I_1 \)

(D) None of the above
41. The value of
\[ \int_{-\pi/2}^{\pi/2} \sqrt{\frac{1}{2}(1+\cos 2x)} \, dx \]
is
(A) 0
(B) 2
(C) \(\frac{1}{2}\)
(D) None of the above

42. Area bounded by the lines
\( y = -2x + 6, \ y = 4x \) and \( y = 0 \) is
(A) 9 sq units
(B) 6 sq units
(C) 4 sq units
(D) None of the above

43. \( \Gamma(n) = \int_0^\infty e^{-x} x^{n-1} \, dx \) converges, if
(A) \( n < 0 \)
(B) \( n \geq 0 \)
(C) \( n > 0 \)
(D) None of the above
44. The solution of differential equation 
\[ x \, dy - y \, dx = 0 \] 
represents

(A) rectangular hyperbola
(B) parabola whose vertex is at origin
(C) circle through centre is at origin
(D) straight line passing through the origin

45. \( y = A + \frac{B}{x} \) (\( A, B \) being arbitrary constants) is the general solution of the differential equation

(A) \( \frac{d^2 y}{dx^2} + \frac{2 \, dy}{x \, dx} = 0 \)
(B) \( \frac{d^2 y}{dx^2} + \frac{dy}{dx} = 0 \)
(C) \( \frac{d^2 y}{dx^2} + 2 \frac{dy}{dx} + 2y = 0 \)
(D) None of the above

44. \( x \, dy - y \, dx = 0 \)  

(A) সমপরাবৃত্ত
(B) অধিবৃত্ত যার শীর্ষবিন্দু হল মূলবিন্দু
(C) বৃত্ত যার কেন্দ্র মূলবিন্দু
(D) মূলবিন্দুগামী সরলরেখার

45. \( y = A + \frac{B}{x} \) (\( A, B \) যদৃঃ ধ্বন্তক)

তা হল

(A) \( \frac{d^2 y}{dx^2} + \frac{2 \, dy}{x \, dx} = 0 \)
(B) \( \frac{d^2 y}{dx^2} + \frac{dy}{dx} = 0 \)
(C) \( \frac{d^2 y}{dx^2} + 2 \frac{dy}{dx} + 2y = 0 \)
(D) উপরের কোনটিই নয়

SPACE FOR ROUGH WORK / রাফ কাজের জন্য জায়গা
46. The general solution of the differential equation
\[ \frac{d^2y}{dx^2} + y = \cos 2x \]
is
(A) \( y = A \cos x + B \sin x + \frac{1}{3} \cos 2x \)
(B) \( y = A \cos x + B \sin x - \frac{1}{3} \cos 2x \)
(C) \( y = A \cos x + B \sin x + \frac{1}{3} \sin 2x \)
(D) \( y = A \cos x + B \sin x - \frac{1}{3} \sin 2x \)

47. The solution of the differential equation
\[ \frac{d^2y}{dx^2} + \frac{dy}{dx} - 2y = 0 \]
when \( x = 0 \), \( y = 3 \) and \( \frac{dy}{dx} = 0 \) is
(A) \( y = e^x + 2e^{2x} \)
(B) \( y = 2e^x + e^{-2x} \)
(C) \( y = e^{2x} + 3e^{-x} \)
(D) None of the above
48. If $f'(x) = x f(x)$ and $f(0) = 1$, then $f(x)$ is equal to
(A) $e^x$
(B) $e^2$
(C) $e^{x^2}$
(D) $e^{\frac{1}{2}x^2}$

49. The slope of a curve $y = f(x)$ is $\sin^2 x$. If the curve passes through the origin, its equation is
(A) $y = x + \sin x \cos x$
(B) $2y = x - \sin x \cos x$
(C) $y = x - \sin x \cos x$
(D) $2y = x + \sin x \cos x$

50. Which of the following statements is incorrect?
(A) $\vec{a} \times (\vec{b} \times \vec{c}) \neq (\vec{a} \times \vec{b}) \times \vec{c}$
(B) $[\vec{a} \vec{a} \vec{c}] = [\vec{a} \vec{b} \vec{b}] = 0$
(C) $\vec{a} \times (\vec{b} \times \vec{c}) = (\vec{a} \cdot \vec{c}) \vec{b} + (\vec{a} \cdot \vec{b})\vec{c}$
(D) $[\vec{a} \vec{b} \vec{c}] = [\vec{c} \vec{a} \vec{b}]$

48. যদি $f'(x) = x f(x)$ এবং $f(0) = 1$ হয়, তাহলে $f(x)$-এর মান হল
(A) $e^x$
(B) $e^2$
(C) $e^{x^2}$
(D) $e^{\frac{1}{2}x^2}$

49. $y = f(x)$ বক্রের নতি $\sin^2 x$. যদি বক্রটি মূলবিন্দুগামী হয়, তাহলে তার সমীকরণ হল
(A) $y = x + \sin x \cos x$
(B) $2y = x - \sin x \cos x$
(C) $y = x - \sin x \cos x$
(D) $2y = x + \sin x \cos x$

50. নিচের কোন বিবৃতিটি সত্য নয়?
(A) $\vec{a} \times (\vec{b} \times \vec{c}) \neq (\vec{a} \times \vec{b}) \times \vec{c}$
(B) $[\vec{a} \vec{a} \vec{c}] = [\vec{a} \vec{b} \vec{b}] = 0$
(C) $\vec{a} \times (\vec{b} \times \vec{c}) = (\vec{a} \cdot \vec{c}) \vec{b} + (\vec{a} \cdot \vec{b})\vec{c}$
(D) $[\vec{a} \vec{b} \vec{c}] = [\vec{c} \vec{a} \vec{b}]$
51. $\vec{p}$ and $\vec{q}$ are two unit vectors. $\vec{p} \times \vec{q}$ is also a unit vector, if
   (A) $\vec{p}$ and $\vec{q}$ are parallel
   (B) $\vec{p}$ and $\vec{q}$ are perpendicular
   (C) $\vec{p}$ and $\vec{q}$ are inclined at 30°
   (D) None of the above

52. If $\vec{x} \cdot \vec{m} = 0$, $\vec{x} \cdot \vec{n} = 0$ and $\vec{x} \cdot \vec{p} = 0$ for some non-zero vector $\vec{x}$, then $[\vec{m} \, \vec{n} \, \vec{p}]$ is equal to
   (A) 0
   (B) 1
   (C) 2
   (D) None of the above

53. The equation of the plane passing through the point $(2, 3, -1)$ and perpendicular to the vector $(3, -4, 7)$ is
   (A) $3x + 4y - 7z = 0$
   (B) $3x + 4y - 7z + 13 = 0$
   (C) $3x - 4y + 7z + 13 = 0$
   (D) $3x - 4y - 7z - 13 = 0$
54. The volume of the tetrahedron whose vertices are \( A(2, -1, -3), B(4, 1, 3), C(3, 2, -1) \) and \( D(1, 4, 2) \) is

(A) \( \frac{7}{3} \) cubic units

(B) \( \frac{7}{2} \) cubic units

(C) \( \frac{7}{2} \) cubic units

(D) None of the above

55. If the vector
\[ \vec{V} = (x + 3y) \hat{i} + (y - 2z) \hat{j} + (x + dz) \hat{k} \]
becomes solenoidal, then the value of ‘\( d \)’ is

(A) 0

(B) 1

(C) 2

(D) -2

56. The angle of rotation about the origin which transforms the equation \( x^2 - y^2 = 4 \) into \( x'y' + 2 = 0 \) is

(A) 30°

(B) 45°

(C) 60°

(D) 90°
57. One of the bisectors of the angle between the pair of straight lines \(2x^2 - 7xy + 2y^2 = 0\) is

(A) \(x = 0\)
(B) \(y = 0\)
(C) \(x + y + 1 = 0\)
(D) \(x = y\)

58. The equation \(ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0\) will represent a circle if

(A) \(a = 1, b = 1\) and \(h = 1\)
(B) \(a = b\) and \(h = 1\)
(C) \(a = b\) and \(h = 0\)
(D) \(a = b = 0\) and \(h = 0\)

59. The length of the chord intercepted by the parabola \(y^2 = 8x\) on the straight line \(2x - y - 3 = 0\) is

(A) \(4\sqrt{5}\) units
(B) \(4\sqrt{2}\) units
(C) \(5\sqrt{2}\) units
(D) None of the above
60. The triangle formed by the points 
(2, 3, 1), (−2, 2, 0) and (0, 1, −1) is
(A) acute-angled
(B) right-angled
(C) obtuse-angled
(D) None of the above

61. The plane \( ax + by + cz + d = 0 \) is parallel to the \( xy \)-plane, if
(A) \( c = 0 \)
(B) \( a = b = 0 \)
(C) \( a = c = 0 \)
(D) \( d = 0 \)

62. The shortest distance between two straight lines
\[
\frac{x - 15}{3} = \frac{y - 29}{8} = \frac{5 - z}{5}
\]
and
\[
\frac{x - 8}{3} = \frac{-y - 9}{16} = \frac{10 - z}{-7}
\]
is
(A) 12 units
(B) \( 12\sqrt{3} \) units
(C) 14 units
(D) \( 14\sqrt{3} \) units
63. The radius of the circle
\[ x^2 + y^2 + z^2 = 25, \quad x + 2y + 2z + 9 = 0 \]
is
(A) 2 units
(B) 3 units
(C) 4 units
(D) 5 units

64. The value of \( c \) for which the plane
\[ x + y + z = c \]
touches the sphere
\[ x^2 + y^2 + z^2 - 2x - 2y - 2z - 6 = 0 \]
is
(A) \( 3(1\pm\sqrt{3}) \)
(B) \( 1\pm\sqrt{3} \)
(C) \( 2(1\pm\sqrt{3}) \)
(D) \( 3(1\pm2\sqrt{3}) \)

65. The linear programming problem
Maximize \( Z = 3x_1 + 4x_2 \)
subject to
\[ x_1 - x_2 \leq -1 \]
\[ -x_1 + x_2 \leq 0 \]
\[ x_1, x_2 \geq 0 \]
has
(A) no feasible solution
(B) infinite number of solutions
(C) unbounded solutions
(D) None of the above
66. The extreme points of the set

\[ S = \{(x, y) \in E^2 ; \; |x| \leq 1, |y| \leq 1\} \]

are

(A) \{(0, 0), (1, 1), (-1, -1)\}
(B) \{(1, 1), (-1, -1)\}
(C) \{(1, 1), (-1, 1), (-1, -1), (1, -1)\}
(D) \{(1, -1), (-1, 1)\}

67. Match the Column—I with Column—II and select the correct option from the codes given below:

<table>
<thead>
<tr>
<th>Column—I</th>
<th>Column—II</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Union of two convex sets</td>
<td>1. forms a basis for ( E^3 )</td>
</tr>
<tr>
<td>b. A circular disc</td>
<td>2. are linearly dependent</td>
</tr>
<tr>
<td>c. The vectors ((-1, 1, 0)) and ((0, 0, 1))</td>
<td>3. is a convex set</td>
</tr>
<tr>
<td>d. The vectors ((2, 1, 3)) and ((1, 1, 1))</td>
<td>4. may not be a convex set</td>
</tr>
</tbody>
</table>

Codes:

(A) a b c d

4 3 1 2

(B) a b c d

3 4 1 2

(C) a b c d

4 3 2 1

(D) a b c d

2 1 3 4

66. \( S = \{(x, y) \in E^2 ; \; |x| \leq 1, |y| \leq 1\} \) সেটের প্রাক্তিক বিন্দুগুলি হল

(A) \{(0, 0), (1, 1), (-1, -1)\}
(B) \{(1, 1), (-1, -1)\}
(C) \{(1, 1), (-1, 1), (-1, -1), (1, -1)\}
(D) \{(1, -1), (-1, 1)\}

67. নীচের স্তন্তু—I এর সাথে স্তন্তু—II মেলাত এবং নীচে প্রদত্ত কোড থেকে সত্ত্বে উত্তরটি চিহ্নিত করো:

স্তন্তু—I          স্তন্তু—II
a. দুটি উত্তল সেটের সংযোগ  1. \( E^3 \)-এর জন্য ভিত্তি গঠন করে
b. একটি বৃত্তাকার চাক্তি  2. রেখিকভাবে নির্ভরশীল
c. \((-1, 1, 0), (1, 1, 0)\) এবং  3. একটি উত্তল সেট \( (0, 0, 1) \) ভেক্টরসমূহ
d. \((2, 3, 1), (2, 1, 3)\) এবং  4. একটি উত্তল সেট নাও হতে পারে

কোড:

(A) a b c d

4 3 1 2

(B) a b c d

3 4 1 2

(C) a b c d

4 3 2 1

(D) a b c d

2 1 3 4
68. \( P, Q \) and \( R \) are three sets of different values of \( x \)
\[
\begin{align*}
P &: 2, 3, 7, 1, 3, 2, 3 \\
Q &: 7, 5, 9, 12, 5, 3, 8 \\
R &: 4, 4, 11, 7, 2, 3, 4 \\
\end{align*}
\]
Select the correct statement from the following:

(A) Mean of \( P \) is equal to mode of \( R \)

(B) Mean, median and mode of \( P \) are same

(C) Mean of \( R \) is equal to median of \( Q \)

(D) Median of \( Q \) is equal to mode of \( P \)

69. If the median of \( \frac{x}{5}, \ x, \frac{x}{4}, \frac{x}{2} \) and \( \frac{x}{3} \) (where \( x > 0 \)) is 8, then the value of \( x \) will be

(A) 24

(B) 32

(C) 8

(D) 16
70. The standard deviation of 6, 8, 10, 12, 14 is
(A) 1
(B) 0
(C) \(\sqrt{8}\)
(D) 2.73

71. The mean deviation of the values 8, 15, 53, 49, 19, 62, 7, 15, 95, 77 about the median is
(A) 27
(B) 27.2
(C) 27.5
(D) 27.75

72. If the correlation coefficient between \(x\) and \(y\) is 0.5, then the correlation coefficient between 7\(x\) and -2\(y\) is
(A) 0.5
(B) -0.5
(C) -14
(D) -14.5
73. A fair coin is tossed 100 times. The probability of getting tails an odd number of times is
(A) \( \frac{1}{2} \)
(B) \( \frac{1}{8} \)
(C) \( \frac{3}{8} \)
(D) None of the above

74. 8 dogs and 8 cats sit in a row. The probability of the 8 cats to sit together is
(A) \( \frac{2 \times 8}{16} \)
(B) \( \frac{8 \times 8}{16} \)
(C) \( \frac{8 \times 9}{16} \)
(D) None of the above

75. A single letter is selected at random from the word PROBABILITY. The probability that it is a vowel is
(A) \( \frac{1}{11} \)
(B) \( \frac{2}{11} \)
(C) \( \frac{3}{11} \)
(D) \( \frac{4}{11} \)
READ THE FOLLOWING INSTRUCTIONS CAREFULLY:

1. Out of the four alternatives for each question, only one circle for the correct answer is to be darkened completely with Black Ballpoint Pen on the OMR Answer Sheet. The answer once marked is not liable to be changed.

2. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except at the specified space on the OMR Answer Sheet.

3. Handle the Question Booklet and Answer Sheet with utmost care, as under no circumstances (except technical defect), another set of Question Booklet and OMR Answer Sheet will be provided.

4. The candidates will write the correct Question Booklet Number and OMR Answer Sheet Number in the Attendance Sheet.

5. Candidates are not allowed to carry any textual material, printed or written, bits of papers, pager, mobile phone, electronic devices or any other material except the Admit Card and Photo Identity Card inside the Examination Hall/Room.

6. Each candidate must show on demand his/her Admit Card and Photo Identity Card to the Invigilator/Examination Officials.

7. No candidate, without special permission of the Centre Superintendent or Invigilator, should change his/her seat.

8. Candidates will have to sign twice in the Attendance Sheet presented by the Invigilator on duty; first after taking their seats in the Examination Hall/Room and second at the time of handing over their OMR Answer Sheet to the Invigilator.

9. The candidates should not leave the Examination Hall/Room without handing over their OMR Answer Sheet to the Invigilator on duty and without signing the Attendance Sheet twice. Cases where a candidate has not signed the Attendance Sheet a second time will be deemed not to have handed over the Answer Sheet and dealt with as an unfair means case.

10. Use of any type of calculating device is prohibited.

11. The candidates are governed by all the rules and regulations of the Board with regard to their conduct in the Examination Hall/Room. All cases of unfair means will be dealt with as per rules and regulations of the Board.

12. No part of the Question Booklet and OMR Answer Sheet shall be detached under any circumstances.

13. On completion of the test, the candidate must hand over the OMR Answer Sheet to the Invigilator in the Hall/Room. The candidates are allowed to take away the Question Booklet with them.

The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except at the specified space on the OMR Answer Sheet.