

Model Question Paper - 1

Time: 2.30 Hrs.]

[Maximum marks: 100

General instructions:

- (i) This question paper consists of four sections. Read the note carefully under each section before answering them.
- (ii) The rough work should be shown at the bottom of the pages of the answer book.
- (iii) Calculator and other electronic devices are not permitted.

Section – A

Note: (i) Answer all the 15 questions.

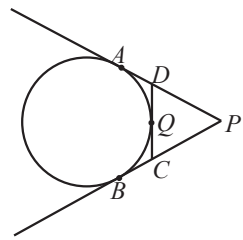
(ii) Each question contains four options. Choose the most suitable answer from the four alternatives.

(iii) Each question carries 1 mark

15 × 1 = 15

1. Given $f(x) = (-1)^x$ is a function from \mathbb{N} to \mathbb{Z} . Then the range of f is
(A) $\{1\}$ (B) \mathbb{N} (C) $\{1, -1\}$ (D) \mathbb{Z}
2. The sequence $-3, -3, -3, \dots$ is
(A) an A.P. only (B) a G.P. only
(C) neither A.P. nor G.P (D) both A.P. and G.P.
3. The 108th term of the sequence $1, -1, 0, 1, -1, 0 \dots$ is
(A) 1 (B) -1 (C) 0 (D) 108
4. If α and β are the roots of $ax^2 + bx + c = 0$, then one of the quadratic equations whose roots are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$, is
(A) $ax^2 + bx + c = 0$ (B) $bx^2 + ax + c = 0$
(C) $cx^2 + bx + a = 0$ (D) $cx^2 + ax + b = 0$
5. The remainder when $7x^2 - 2x + 1$ is divided by $x - 3$ is
(A) 58 (B) 70 (C) 0 (D) 3
6. A is of order $m \times n$ and B is of order $p \times q$, addition of A and B is possible only if
(A) $m = p$ (B) $n = q$ (C) $n = p$ (D) $m = p, n = q$
7. The value of k if the straight lines $3x + 6y + 7 = 0$ and $2x + ky = 5$ are perpendicular is
(A) 1 (B) -1 (C) 2 (D) $\frac{1}{2}$
8. The length of a diagonal of the quadrilateral whose vertices are $(1,0), (0,1), (-1,0)$ and $(0,-1)$ is _____ units.
(A) 1 (B) -1 (C) 2 (D) $\sqrt{2}$

9. In the figure, PA and PB are tangents to the circle drawn from an external point P. Also CD is a tangent to the circle at Q. If PA = 8 cm and CQ = 3 cm, then PC is equal to



- (A) 11 cm (B) 5 cm
(C) 24 cm (D) 38 cm
10. The areas of two similar triangles are 16 cm^2 and 36 cm^2 respectively. If the altitudes are in the ratio $2 : x$, then x is
- (A) 2 (B) 3 (C) 4 (D) 6
11. $\cos^4 x - \sin^4 x =$
- (A) $2 \sin^2 x - 1$ (B) $2 \cos^2 x - 1$ (C) $1 + 2 \sin^2 x$ (D) $1 - 2 \cos^2 x$.
12. $\sin^2 \theta + \cos^2 \theta + \sec^2 \theta - \tan^2 \theta - \operatorname{cosec}^2 \theta + \cot^2 \theta =$
- (A) 0 (B) 1 (C) 2 (D) 3
13. If the surface area of a sphere is $36\pi \text{ cm}^2$, then the volume of the sphere is equal to
- (A) $12\pi \text{ cm}^3$ (B) $36\pi \text{ cm}^3$ (C) $72\pi \text{ cm}^3$ (D) $108\pi \text{ cm}^3$.
14. Variance of the first 11 natural numbers is
- (A) $\sqrt{5}$ (B) $\sqrt{10}$ (C) $5\sqrt{2}$ (D) 10
15. If $P(A) = 0.25$, $P(B) = 0.50$, $P(A \cap B) = 0.14$ then $P(\text{neither } A \text{ nor } B) =$
- (A) 0.39 (B) 0.25 (C) 0.11 (D) 0.24

Section – B

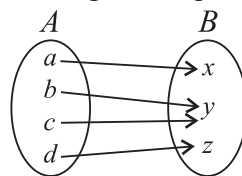
Note: (i) Answer 10 questions.

(ii) Answer any 9 questions from the first 14 questions. Question no. 30 is compulsory.

(iii) Each question carries 2 marks.

10 × 2 = 20

16. Let $P = \{a, b, c\}$, $Q = \{g, h, x, y\}$ and $R = \{a, e, f, s\}$. Find $R \setminus (P \cap Q)$.
17. Does each of the following arrow diagrams represent a function? Explain.



18. Find the sum of the first 25 terms of the geometric series $16 - 48 + 144 - 432 + \dots$

19. What rational expression should be added to $\frac{x^3 - 1}{x^2 + 2}$ to get $\frac{2x^3 - x^2 + 3}{x^2 + 2}$?

20. Form a quadratic equation whose roots are $\frac{4 + \sqrt{7}}{2}, \frac{4 - \sqrt{7}}{2}$
21. Construct a 2×3 matrix $A = [a_{ij}]$ whose elements are given by $a_{ij} = |2i - 3j|$
22. If $A = \begin{pmatrix} 4 & -2 \\ 5 & -9 \end{pmatrix}$ and $B = \begin{pmatrix} 8 & 2 \\ -1 & -3 \end{pmatrix}$ find $6A - 3B$.
23. If $(7, 3), (6, 1), (8, 2)$ and $(p, 4)$ are the vertices of a parallelogram taken in order, then find the value of p .
24. In $\triangle ABC$, the internal bisector AD of $\angle A$ meets the side BC at D . If $BD = 2.5$ cm, $AB = 5$ cm and $AC = 4.2$ cm, then find DC .
25. A girl of height 150 cm stands in front of a lamp-post and casts a shadow of length $150\sqrt{3}$ cm on the ground. Find the angle of elevation of the top of the lamp-post.
26. Prove: $\sqrt{\frac{1 - \sin \theta}{1 + \sin \theta}} = \sec \theta - \tan \theta$
27. The radii of two right circular cylinders are in the ratio $2 : 3$. Find the ratio of their volumes if their heights are in the ratio $5 : 3$.
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. A ticket is drawn from a bag containing 100 tickets. The tickets are numbered from one to hundred. What is the probability of getting a ticket with a number divisible by 10?
30. (a) Find the x and y intercepts of the straight line $\frac{10}{y} + \frac{9}{x} = -\frac{8}{xy}$.
- (OR)
- (b) If the total surface area of a solid right circular cylinder is thrice its curved surface area, then find the height in terms of its radius.

Section – C

Note: (i) Answer 9 questions.

(ii) Answer any 8 questions from the first 14 questions. Question no. 45 is compulsory.

(iii) Each question carries 5 marks

9 × 5 = 45

31. Using venn diagram, verify $A \setminus (B \cup C) = (A \setminus B) \cap (A \setminus C)$
32. Let $A = \{0, 1, 2, 3\}$ and $B = \{1, 3, 5, 7, 9\}$ be two sets. Let $f : A \rightarrow B$ be a function given by $f(x) = 2x + 1$. Represent this function as (i) a set of ordered pairs (ii) a table (iii) an arrow diagram and (iv) a graph.
33. Find the sum of first n terms of the series. $7 + 77 + 777 + \dots$.
34. Factorize the following polynomial. $x^3 - 2x^2 - 5x + 6$
35. Find the square root of the polynomial $9x^4 - 6x^3 + 7x^2 - 2x + 1$ by division method.
36. If $A = \begin{pmatrix} -2 \\ 4 \\ 5 \end{pmatrix}$ and $B = (1 \ 3 \ -6)$, then verify that $(AB)^T = B^T A^T$.

37. Find the area of the quadrilateral whose vertices are (6,9), (7,4), (4,2) and (3,7)
38. The vertices of a $\triangle ABC$ are A(1, 2), B(-4, 5) and C(0, 1). Find the slopes of the altitudes of the triangle.
39. If all sides of a parallelogram touch a circle, show that the parallelogram is a rhombus.
40. A vertical tree is broken by the wind. The top of the tree touches the ground and makes an angle 30° with it. If the top of the tree touches the ground 30 m away from its foot, then find the actual height of the tree.
41. A spherical solid material of radius 18 cm is melted and recast into three small solid spherical spheres of different sizes. If the radii of two spheres are 2cm and 12 cm, find the radius of the third sphere.
42. A solid wooden toy is in the form of a cone surmounted on a hemisphere. If the radii of the hemisphere and the base of the cone are 3.5 cm each and the total height of the toy is 17.5 cm, then find the volume of wood used in the toy. (Take $\pi = \frac{22}{7}$)
43. For a collection of data, if $\Sigma x = 35$, $n = 5$, $\Sigma(x - 9)^2 = 82$, then find Σx^2 and $\Sigma(x - \bar{x})^2$
44. The probability that A , B and C can solve a problem are $\frac{4}{5}$, $\frac{2}{3}$ and $\frac{3}{7}$ respectively. The probability of the problem being solved by A and B is $\frac{8}{15}$, B and C is $\frac{2}{7}$, A and C is $\frac{12}{35}$. The probability of the problem being solved by all the three is $\frac{8}{35}$. Find the probability that the problem can be solved by atleast one of them.
45. (a) Find the sum of all natural numbers between 400 and 600 which are divisible by 11.

(OR)

(b) Prove that
$$\frac{1 - x^4}{1 - x} + \frac{1 - x^3}{1 + x} = \frac{2(1 + x + x^2) + x^3}{1 + x}$$

Section – D

- Note: (i) This section contains 2 questions, each with two alternatives.
(ii) Answer both the questions choosing either of the alternatives.
(iii) Each question carries 10 marks

2 × 10 = 20

46. (a). Draw a circle of radius 3.2 cm. At a point P on it, draw a tangent to the circle using the tangent-chord theorem.

(OR)

- (b) Construct a cyclic quadrilateral $ABCD$, where $AB = 6.5$ cm, $\angle ABC = 110^\circ$, $BC = 5.5$ cm and $AB \parallel CD$.

47. (a) Draw the graph of $y = 2x^2 + x - 6$ and hence solve $2x^2 + x - 10 = 0$.

(OR)

- (b) The cost of the milk per litre is ₹15. Draw the graph for the relation between the quantity and cost. Hence find (i) the proportionality constant. (ii) the cost of 3 litres of milk.

Model Question Paper - 2

Time: 2.30 Hrs.]

[Maximum marks: 100

General instructions:

- (i) This question paper consists of four sections. Read the note carefully under each section before answering them.
- (ii) The rough work should be shown at the bottom of the pages of the answer book.
- (iii) Calculator and other electronic devices are not permitted.

Section – A

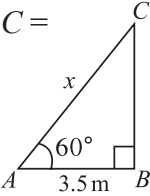
Note: (i) Answer **all** the 15 questions.

(ii) Each question contains four options. Choose the most suitable answer from the four alternatives.

(iii) Each question carries 1 mark

15 × 1 = 15

1. If $A = \{p, q, r, s\}$, $B = \{r, s, t, u\}$, then $A \setminus B$ is
(A) $\{p, q\}$ (B) $\{t, u\}$ (C) $\{r, s\}$ (D) $\{p, q, r, s\}$
2. If the n th term of a sequence is $100n + 10$, then the sequence is
(A) an A.P. (B) a G.P.
(C) a constant sequence (D) neither A.P. nor G.P.
3. General term of the sequence $\frac{2}{5}, \frac{6}{25}, \frac{18}{125}, \dots$ is
(A) $\frac{3}{5}$ (B) $\left(\frac{2}{5}\right)^{n-1}$ (C) $\left(\frac{2}{5}\right)\left(\frac{3}{5}\right)^{n-1}$ (D) $\left(\frac{3}{5}\right)\left(\frac{2}{5}\right)^{n-1}$
4. If $ax^2 + bx + c = 0$ has equal roots, then c is equal
(A) $\frac{b^2}{2a}$ (B) $\frac{b^2}{4a}$ (C) $-\frac{b^2}{2a}$ (D) $-\frac{b^2}{4a}$
5. $(x - a)$ is a factor of $p(x)$ if and only if ...
(A) $P(a) = p(x)$ (B) $p(a) \neq 0$ (C) $p(a) = 0$ (D) $p(-a) = 0$
6. If A and B are square matrices such that $AB = I$ and $BA = I$, then B is
(A) Unit matrix (B) Null matrix
(C) Multiplicative inverse matrix of A (D) $-A$
7. The centroid of the triangle with vertices at $(-2, -5)$, $(-2, 12)$ and $(10, -1)$ is
(A) $(6, 6)$ (B) $(4, 4)$ (C) $(3, 3)$ (D) $(2, 2)$
8. The angle of inclination of the line passing through the points $(1, 2)$, and $(2, 3)$ is
(A) 30° (B) 45° (C) 60° (D) 90°
9. The sides of two similar triangles are in the ratio 2:3, then their areas are in the ratio
(A) 9:4 (B) 4:9 (C) 2:3 (D) 3:2

10. In $\triangle ABC$ a straight line $DE \parallel BC$, intersects AB at D and AC at E , then
 (A) $\frac{AB}{AD} = \frac{AC}{AE}$ (B) $\frac{AB}{AE} = \frac{AC}{AD}$ (C) $\frac{AB}{EC} = \frac{AC}{DB}$ (D) $AB = AC$
11. $(1 - \cos^2 \theta)(1 + \cot^2 \theta) =$
 (A) $\sin^2 \theta$ (B) 0 (C) 1 (D) $\tan^2 \theta$
12. In the adjoining figure $\angle CAB = 60^\circ$. $AB = 3.5\text{m}$, then $AC =$
 (A) 7 m (B) 3.5 m
 (C) 1.75 m (D) 1 m
- 
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. The variance of 10, 10, 10, 10, 10 is
 (A) 10 (B) $\sqrt{10}$ (C) 5 (D) 0
15. If A and B are two events such that $P(A) = 0.25$, $P(B) = 0.05$ and $P(A \cap B) = 0.14$, then $P(A \cup B) =$
 (A) 0.61 (B) 0.16 (C) 0.14 (D) 0.6

Section – B

Note: (i) Answer 10 questions

(ii) Answer any 9 questions from the first 14 questions. Question no. 30 is compulsory.

(iii) Each question carries two marks

10 × 2 = 20

16. If $A \subset B$, then find $A \cap B$ and $A \setminus B$ (use Venn diagram).
17. Let $A = \{ 1, 2, 3, 4, 5 \}$, $B = \mathbb{N}$ and $f : A \rightarrow B$ be defined by $f(x) = x^2$. Find the range of f . Identify the type of function.
18. Find the sum of the series. $1^3 + 2^3 + 3^3 + \dots + 20^3$
19. Multiply the following and write your answer in lowest terms. $\frac{x^2 - 81}{x^2 - 4} \times \frac{x^2 + 6x + 8}{x^2 - 5x - 36}$
20. Construct a 2×2 matrix $A = [a_{ij}]$ whose elements are given by $a_{ij} = \frac{i - j}{i + j}$
21. If $A = \begin{pmatrix} 8 & -7 \\ -2 & 4 \\ 0 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 9 & -3 & 2 \\ 6 & -1 & -5 \end{pmatrix}$, then find BA if it exist.
22. Find the coordinates of the point which divides the line segment joining $(-3, 5)$ and $(4, -9)$ in the ratio 1 : 6 internally.
23. Find the equation of the straight line passing through the point $(-2, 3)$ with slope $\frac{1}{3}$.

24. In $\triangle ABC$, AE is the external bisector of $\angle A$, meeting BC produced at E . If $AB = 10$ cm, $AC = 6$ cm and $BC = 12$ cm, then find CE .
25. Prove: $\sec \theta (1 - \sin \theta)(\sec \theta + \tan \theta) = 1$
26. Find the angular elevation (angle of elevation from the ground level) of the Sun when the length of the shadow of a 30 m long pole is $10\sqrt{3}$ m.
27. If the circumference of the base of a solid right circular cone is 236 cm and its slant height is 12 cm, find its curved surface area.
28. If the coefficient of variation of a collection of data is 57 and its S.D is 6.84, then find the mean.
29. Three coins are tossed simultaneously. Find the probability of getting at least two heads.
30. (a) Simplify. $\frac{4x^3 - 12x^2}{2x^2 - 18} - x$
- (OR)
- (b) The surface area of a sphere is 616 sq.cm. Find its diameter.

Section – C

Note: (i) Answer 9 questions

(ii) Answer any 8 questions from the first 14 questions. Question no. 45 is compulsory.

(iii) Each question carries five marks

9 × 5 = 45

31. A radio station surveyed 190 students to determine the types of music they liked. The survey revealed that 114 liked rock music, 50 liked folk music, and 41 liked classical music, 14 liked rock music and folk music, 15 liked rock music and classical music, 11 liked classical music and folk music. 5 liked all the three types of music.
- Find (i) how many did not like any of the 3 types?
(ii) how many liked any two types only?
(iii) how many liked folk music but not rock music?
32. Let $A = \{4, 6, 8, 10\}$ and $B = \{3, 4, 5, 6, 7\}$. If $f : A \rightarrow B$ is defined by $f(x) = \frac{1}{2}x + 1$ then represent f by (i) an arrow diagram (ii) a set of ordered pairs and (iii) a table.
33. Find the sum to n terms of the series $6 + 66 + 666 + \dots$
34. The GCD of $x^4 + 3x^3 + 5x^2 + 26x + 56$ and $x^4 + 2x^3 - 4x^2 - x + 28$ is $x^2 + 5x + 7$. Find their LCM.
35. Find the values of a and b if the polynomial is perfect squares.
 $4x^4 - 12x^3 + 37x^2 + ax + b$
36. If α and β are the roots of $5x^2 - px + 1 = 0$ and $\alpha - \beta = 1$, then find p .

37. If $A = \begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix}$ then show that $A^2 - 4A + 5I_2 = O$.
38. Find the equation of the perpendicular bisector of the straight line segment joining the points (3, 4) and (-1, 2).
39. ABCD is a quadrilateral with AB parallel to CD. A line drawn parallel to AB meets AD at P and BC at Q. Prove that $\frac{AP}{PD} = \frac{BQ}{QC}$.
40. From the top and foot of a 40 m high tower, the angles of elevation of the top of a lighthouse are found to be 30° and 60° respectively. Find the height of the lighthouse. Also find the distance of the top of the lighthouse from the foot of the tower.
41. If the total surface area of a solid right circular cylinder is 880 sq.cm and its radius is 10 cm, find its curved surface area. (Take $\pi = \frac{22}{7}$)
42. A tent is in the shape of a right circular cylinder surmounted by a cone. The total height and the diameter of the base are 13.5 m and 28 m. If the height of the cylindrical portion is 3 m, find the total surface area of the tent.
43. Find the standard deviation of the numbers 62, 58, 53, 50, 63, 52, 55.
44. A die is thrown twice. Find the probability that at least one of the two throws comes up with the number 5 (use addition theorem).
45. (a) The sum of first 10 terms of an A.P. is 25 and the common difference is twice the first term. Find the 10th term.

(OR)

- (b) Find the area of the quadrilateral whose vertices are (-1, 6), (-3, -9), (5, -8) and (3, 9)

Section – D

- Note: (i) This section contains two questions, each with two alternatives.
(ii) Answer both the questions choosing either of the alternatives.
(iii) Each question carries ten marks

2 × 10 = 20

46. (a) Construct a cyclic quadrilateral ABCD where AB = 6 cm, AD = 4.8 cm, BD = 8 cm and CD = 5.5 cm.
(OR)
(b) Construct a ΔPQR in which the base PQ = 6 cm, $\angle R = 60^\circ$ and the altitude from R to PQ is 4 cm.
47. (a) Draw the graph of $y = 2x^2$ and hence solve $2x^2 + x - 6 = 0$.
(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 $y = 10$.

Model Question Paper - 3

Time: 2.30 Hrs.]

[Maximum marks: 100

General instructions:

- (i) This question paper consists of four sections. Read the note carefully under each section before answering them.
- (ii) The rough work should be shown at the bottom of the pages of the answer book.
- (iii) Calculator and other electronic devices are not permitted.

Section – A

Note: (i) Answer **all** the 15 questions.

(ii) Each question contains four options. Choose the most suitable answer from the four alternatives.

(iii) Each question carries 1 mark

15 × 1 = 15

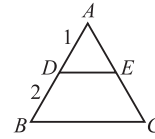
1. Which one of the following is not true ?
(A) $A \setminus B = A \cap B'$ (B) $A \setminus B = A \cap B$
(C) $A \setminus B = (A \cup B) \cap B'$ (D) $A \setminus B = (A \cup B) \setminus B$
2. If a, b, c are in G.P, then $\frac{a-b}{b-c}$ is equal to
(A) $\frac{a}{b}$ (B) $\frac{b}{a}$ (C) $\frac{a}{c}$ (D) $\frac{c}{b}$
3. The 17th term of the A.P 19, 14, 9, ... is
(A) 84 (B) -61 (C) -84 (D) -51
4. If one zero of the polynomial $p(x) = (k + 4)x^2 + 13x + 3k$ is reciprocal of the other, then k is equal to
(A) 2 (B) 3 (C) 4 (D) 5
5. The quadratic equation $x^2 - kx + 4 = 0$ has equal roots, then the value of k is/are
(A) ± 4 (B) 2 (C) 3 (D) ± 5
6. If $A = [a_{ij}]_{2 \times 2}$ and $a_{ij} = i + j$, then $A =$
(A) $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ (B) $\begin{pmatrix} 2 & 3 \\ 3 & 4 \end{pmatrix}$ (C) $\begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$ (D) $\begin{pmatrix} 4 & 5 \\ 6 & 7 \end{pmatrix}$
7. 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
8. The angle of inclination of the straight line $x = \sqrt{3}y$ is
(A) 0° (B) 60° (C) 30° (D) 45°

9. In $\triangle ABC$, DE is \parallel to BC , meeting AB and AC at D and E . If $AD = 3$ cm, $DB = 2$ cm and $AE = 2.7$ cm, then AC is equal to

- (A) 6.5 cm (B) 4.5 cm (C) 3.5 cm (D) 5.5 cm

10. In figure $DE \parallel BC$ and $\triangle ABC \sim \triangle ADE$ if $AD = 1$ cm, $BD = 2$ cm, then the ratio of the area of $\triangle ABC$ to the area of $\triangle ADE$ is

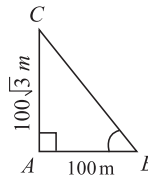
- (A) 1 : 9 (B) 1 : 2 (C) 9 : 1



- (D) 2 : 1

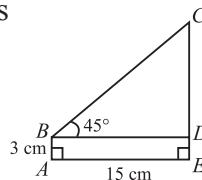
11. In the adjoining figure $\angle ABC =$

- (A) 45° (B) 30°
(C) 60° (D) 50°



12. In the figure the height of the CE is

- (A) 15 cm (B) 12 cm
(C) 45 cm (D) 18 cm



13. The surface areas of two spheres are in the ratio of 9 : 25. Then their volumes are in the ratio

- (A) 81 : 625 (B) 729 : 15625 (C) 27 : 75 (D) 27 : 125

14. If t is the standard deviation of x, y, z , then the standard deviation of $x + 5, y + 5, z + 5$ is

- (A) $\frac{t}{3}$ (B) $t + 5$ (C) t (D) xyz

15. The probabilities of three mutually exclusive events A, B and C are given by $\frac{1}{3}, \frac{1}{4}$ and $\frac{5}{12}$. Then $P(A \cup B \cup C)$ is

- (A) $\frac{19}{12}$ (B) $\frac{11}{12}$ (C) $\frac{7}{12}$ (D) 1

Section – B

Note: (i) Answer 10 questions

(ii) Answer any 9 questions from the first 14 questions. Question no. 30 is compulsory.

(iii) Each question carries two marks

10 × 2 = 20

16. Let $U = \{4, 8, 12, 16, 20, 24, 28\}$, $A = \{8, 16, 24\}$ and $B = \{4, 16, 20, 28\}$.

Find $(A \cup B)'$.

17. Verify whether the relation $f = \{ (1, 2), (4, 5), (9, 4), (16, 5) \}$ is a function from $A = \{ 1, 4, 9, 16 \}$ to $B = \{ -1, 2, -3, -4, 5, 6 \}$. In case of a function, write down its range.
18. Find the quotient and remainder using synthetic division when $(x^3 + x^2 - 3x + 5)$ is divided by $(x - 1)$.
19. If the sum and product of the roots of the quadratic equation $ax^2 - 5x + c = 0$ are both equal to 10, then find the values of a and c .
20. If $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & -5 \\ 3 & -5 & 6 \end{pmatrix}$, then verify that $(A^T)^T = A$.
21. Prove that $\begin{pmatrix} 3 & 5 \\ 1 & 2 \end{pmatrix}$ and $\begin{pmatrix} 2 & -5 \\ -1 & 3 \end{pmatrix}$ are multiplicative inverses to each other.
22. Find the equation of the straight line perpendicular to the straight line $x - 2y + 3 = 0$ and passing through the point $(1, -2)$.
23. AB and CD are two chords of a circle which intersect each other externally at P . If $AB = 4$ cm, $BP = 5$ cm and $PD = 3$ cm, then find CD .
24. Prove the following identity $\frac{1 + \cos \theta - \sin^2 \theta}{\sin \theta (1 + \cos \theta)} = \cot \theta$.
25. 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.
26. A solid right circular cylinder has radius 7 cm and height 20cm. Find total surface area. (Take $\pi = \frac{22}{7}$)
27. The outer and the inner radii of a hollow sphere are 12 cm and 10 cm. Find its volume.
28. Find the standard deviation of the first 10 natural numbers.
29. If A and B are two events such that $P(A) = \frac{1}{4}$, $P(B) = \frac{2}{5}$ and $P(A \cup B) = \frac{1}{2}$, then find $P(A \cap B)$.
30. (a) Find the sum of $1 + 5 + 5^2 + \dots$ upto 8 terms (OR)
 (b) Find the equation of the straight line whose x and y intercepts are $-\frac{2}{7}$ and $\frac{3}{5}$.

Section – C

Note: (i) Answer 9 questions

(ii) Answer any 8 questions from the first 14 questions. Question no. 45 is compulsory.

(iii) Each question carries five marks

9 × 5 = 45

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

32. Let $A = \{ 5, 6, 7, 8 \}$; $B = \{ -11, 4, 7, -10, -7, -9, -13 \}$ and $f = \{ (x, y) : y = 3 - 2x, x \in A, y \in B \}$
- Write down the elements of f .
 - What is the co-domain?
 - What is the range ?
 - Identify the type of function.
33. If the product of three consecutive terms in G.P. is 216 and sum of their products in pairs is 156, find them.
34. Find the total area of 14 squares whose sides are 11 cm, 12 cm, \dots , 24 cm, respectively.
35. The LCM and GCD of two polynomials are $(x^3 - 4x)(5x + 1)$ and $(5x^2 + x)$ respectively. If one of the polynomial $p(x) = (5x^3 - 9x^2 - 2x)$, then find the other polynomial $q(x)$.
36. Solve the equation $\frac{1}{x+1} + \frac{2}{x+2} = \frac{4}{x+4}$, where $x+1 \neq 0$, $x+2 \neq 0$ and $x+4 \neq 0$ using quadratic formula.
37. If $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ and $I_2 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, then show that $A^2 - (a+d)A = (bc - ad)I_2$.
38. In what ratio is the line joining the points $(-5, 1)$ and $(2, 3)$ divided by the y-axis? Also, find the point of intersection.
39. The vertices of $\triangle ABC$ are $A(1, 8)$, $B(-2, 4)$, $C(8, -5)$. If M and N are the midpoints of AB and AC respectively, find the slope of MN and hence verify that MN is parallel to BC .
40. The image of a tree on the film of a camera is of length 35 mm, the distance from the lens to the film is 42 mm and the distance from the lens to the tree is 6 m. How tall is the portion of the tree being photographed?
41. If $\tan \theta = n \tan \alpha$ and $\sin \theta = m \sin \alpha$, then prove that $\cos^2 \theta = \frac{m^2 - 1}{n^2 - 1}$.
42. Radius and slant height of a solid right circular cone are in the ratio 3 : 5. If the curved surface area is 60π sq.cm, then find its total surface area.
43. The mean and the standard deviation of a group of 20 items was found to be 40 and 15 respectively. While checking it was found that an item 43 was wrongly written as 53. Calculate the correct mean and standard deviation.
44. Two dice are rolled and the product of the outcomes (numbers) are found. What is the probability that the product so found is a prime number?
45. (a) A solid sphere of diameter 42 cm is melted and recast into a number of smaller identical cones, each of diameter 7 cm and height 3 cm. Find the number of cones so formed
- (OR)
- (b) Find the square root of $81x^4 - 72x^3 + 70x^2 - 24x + 9$.

Section – D

- Note: (i) This section contains 2 questions, each with two alternatives.
(ii) Answer both the questions choosing either of the alternatives.
(iii) Each question carries 10 marks

$$2 \times 10 = 20$$

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 PQRS given $PQ = 5$ cm, $QR = 4$ cm, $\angle QPR = 35^\circ$ and $\angle PRS = 70^\circ$.

47. (a) A cyclist travels from a place A to a place B along the same route at a uniform speed on different days. The following table gives the speed of his travel and the corresponding time he took to cover the distance.

Speed in km/hr x	2	4	6	10	12
Time in hrs y	60	30	20	12	10

Draw the speed-time graph and use it to find

- (i) the number of hours he will take if he travels at a speed of 5 km/hr
(ii) the speed with which he should travel if he has to cover the distance in 40 hrs.

(OR)

- (b) Draw the graph of $y = x^2 + x - 12$ and hence solve $x^2 + 2x + 2 = 0$.

Model Question Paper - 4

Time: 2.30 Hrs.]

[Maximum marks: 100

General instructions:

- (i) This question paper consists of four sections. Read the note carefully under each section before answering them.
- (ii) The rough work should be shown at the bottom of the pages of the answer book.
- (iii) Calculator and other electronic devices are not permitted.

Section – A

Note: (i) Answer **all** the 15 questions.

(ii) Each question contains four options. Choose the most suitable answer from the four alternatives.

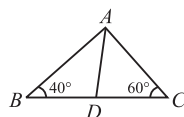
(iii) Each question carries 1 mark

15 × 1 = 15

1. If $A = \{ 5, 6, 7 \}$, $B = \{ 1, 2, 3, 4, 5 \}$ and $f : A \rightarrow B$ is defined by $f(x) = x - 2$, then the range of f is
(A) $\{ 1, 4, 5 \}$ (B) $\{ 1, 2, 3, 4, 5 \}$ (C) $\{ 2, 3, 4 \}$ (D) $\{ 3, 4, 5 \}$
2. The next term of $\frac{1}{20}$ in the sequence $\frac{1}{2}, \frac{1}{6}, \frac{1}{12}, \frac{1}{20}, \dots$ is
(A) $\frac{1}{24}$ (B) $\frac{1}{22}$ (C) $\frac{1}{30}$ (D) $\frac{1}{18}$
3. If a, b and c are the three consecutive terms of a G.P., then
(A) $\frac{c}{a} = \frac{b}{c}$ (B) $\frac{c}{a} = \frac{b}{a}$ (C) $\frac{c}{a} = \left(\frac{b}{a}\right)^2$ (D) $\frac{a}{c} = \frac{b}{a}$
4. If $\frac{a^3}{a-b}$ is added with $\frac{b^3}{b-a}$, then the new expression is
(A) $a^2 + ab + b^2$ (B) $a^2 - ab + b^2$ (C) $a^3 + b^3$ (D) $a^3 - b^3$
5. $\frac{a+b}{a-b} - \frac{a-b}{b-a} =$
(A) 1 (B) $\frac{2b}{a-b}$ (C) $\frac{2b}{b-a}$ (D) $\frac{2(a+b)}{a-b}$
6. If $\begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$, then the values of x and y respectively, are
(A) 2, 0 (B) 0, 2 (C) 0, -2 (D) 1, 1
7. 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. Angle of inclination of the line joining the two points $(2, \sqrt{3})$ and $(5, 2\sqrt{3})$ is
(A) 30° (B) 45° (C) 60° (D) 90°

9. In figure, if $\frac{AB}{AC} = \frac{BD}{DC}$, $\angle B = 40^\circ$, and $\angle C = 60^\circ$, then $\angle BAD =$

- (A) 30° (B) 50°
 (C) 80° (D) 40°



10. In $\triangle ABC$, $DE \parallel BC$ and $\frac{AD}{DB} = \frac{2}{3}$. If $AE = 6$ then BC is

- (A) 9 (B) 18 (C) 15 (D) 12

11. If $x = a \sec \theta$, $y = b \tan \theta$, then the value of $\frac{x^2}{a^2} - \frac{y^2}{b^2} =$

- (A) 1 (B) -1 (C) $\tan^2 \theta$ (D) $\operatorname{cosec}^2 \theta$

12. $\frac{\tan^2 \theta - \sec^2 \theta}{\operatorname{cosec}^2 \theta - \cot^2 \theta} =$

- (A) 1 (B) -1 (C) $\sin \theta$ (D) $\cos \theta$

13. The ratios of the respective heights and the respective radii of two cylinders are 1:2 and 2:1 respectively. Then their respective volumes are in the ratio

- (A) 4 : 1 (B) 1 : 4 (C) 2 : 1 (D) 1 : 2

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. The probability that a leap year will have 53 Fridays or 53 Saturdays is

- (A) $\frac{2}{7}$ (B) $\frac{1}{7}$ (C) $\frac{4}{7}$ (D) $\frac{3}{7}$

Section – B

Note: (i) Answer 10 questions

(ii) Answer any 9 questions from the first 14 questions. Question no. 30 is compulsory.

(iii) Each question carries 2 marks

10 × 2 = 20

16. Draw the Venn diagram $(B \cup C) \setminus A$.

17. Let $|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$, where $x \in \mathbb{R}$. Does the relation $\{(x, y) \mid y = |x|, x \in \mathbb{R}\}$

define a function? Find its range.

18. Find the zeros of the quadratic polynomial $6x^2 - 3 - 7x$ and verify the basic relationships between the zeros and the coefficients.

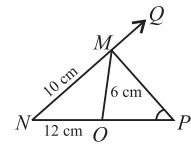
19. If α and β are the roots of the equation $3x^2 - 5x + 2 = 0$, find the value of

$$\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$$

20. 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 $C = 2A + B$.

21. Solve: $\begin{pmatrix} y \\ 3x \end{pmatrix} = \begin{pmatrix} 6 - 2x \\ 31 + 4y \end{pmatrix}$.

22. The side BC of an equilateral $\triangle ABC$ is parallel to x -axis. Find the slope of AB and the slope of BC
23. If the area of the $\triangle ABC$ is 12 sq.units and the vertices are $A(a, -3)$, $B(3, a)$ and $C(-1, 5)$ taken in order, then find the value of a .
24. In a $\triangle MNO$, MP is the external bisector of $\angle M$ meeting NO produced at P . If $MN = 10$ cm, $MO = 6$ cm, $NO = 12$ cm, then find OP .
25. Prove that $\frac{1 + \sec \theta}{\sec \theta} = \frac{\sin^2 \theta}{1 - \cos \theta}$.
26. A pendulum of length 40 cm subtends 60° at the vertex in one full oscillation. What will be the shortest distance between the initial position and the final position of the bob?
27. The radii of two circular ends of a frustum shaped bucket are 15 cm and 8 cm. If its depth is 63 cm, find the capacity of the bucket in litres. (Take $\pi = \frac{22}{7}$)
28. The weight (in kg) of 13 students in a class are 42.5, 47.5, 48.6, 50.5, 49, 46.2, 49.8, 45.8, 43.2, 48, 44.7, 46.9, 42.4. Find the range and coefficient of range.
29. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball from the bag is thrice that of drawing a red ball, then find the number of blue balls in the bag.
30. (a) Find the sum of all odd natural number between 6 and 40
- (OR)
- (b) Find the curved surface area of a cone whose volume and height are 120π cm³ and 10 cm respectively.



Section – C

- Note: (i) Answer 9 questions
(ii) Answer any 8 questions from the first 14 questions. Question no. 45 is compulsory.
(iii) Each question carries 5 marks

9 × 5 = 45

31. Use Venn diagrams to verify $(A \cap B)' = A' \cup B'$.
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 first 20 terms of the arithmetic series in which 3rd term is 7 and 7th term is 2 more than three times its 3rd term.
34. The first term of a geometric series is 375 and the fourth term is 192. Find the common ratio and the sum of the first 14 terms.
35. Factorize $2x^3 - 3x^2 - 3x + 2$ into linear factors.
36. Simplify $\left[\frac{2x+5}{x+1} + \frac{x^2+1}{x^2-1} \right] - \left(\frac{3x-2}{x-1} \right)$ in the simplest form.

37. If $A = \begin{pmatrix} 3 & 3 \\ 7 & 6 \end{pmatrix}$, $B = \begin{pmatrix} 8 & 7 \\ 0 & 9 \end{pmatrix}$ and $C = \begin{pmatrix} 2 & -3 \\ 4 & 6 \end{pmatrix}$, find $(A + B)C$ and $AC + BC$.

Is $(A + B)C = AC + BC$?

38. The vertices of a $\triangle ABC$ are $A(2, 1)$, $B(-2, 3)$ and $C(4, 5)$. Find the equation of the median through the vertex A .
39. State and prove the converse of Thales Theorem.
40. From the top of a tower of height 60 m, the angles of depression of the top and the bottom of a building are observed to be 30° and 60° respectively. Find the height of the building.
41. The total surface area of a solid right circular cylinder is 231 cm^2 . Its curved surface area is two thirds of the total surface area. Find the radius and height of the cylinder.
42. A circus tent is to be erected in the form of a cone surmounted on a cylinder. The total height of the tent is 49 m. Diameter of the base is 42 m and height of the cylinder is 21 m. Find the cost of canvas needed to make the tent, if the cost of canvas is $\text{₹}12.50/\text{m}^2$. (Take $\pi = \frac{22}{7}$)
43. Find the standard deviation of the following distribution.

x	70	74	78	82	86	90
f	1	3	5	7	8	12

44. Two dice are rolled simultaneously. Find the probability that the sum of the numbers on the faces is neither divisible by 3 nor by 4.
45. (a) If $25x^4 - 30x^3 - 11x^2 + ax - b$ is a perfect square, then find a and b

(OR)

(b) Find the equation of a straight line which is passing through the point of intersection of the straight lines $2x + 3y - 1 = 0$ and $3x + 2y = 4$, and the midpoint of the straight line joining the two points $\left(\frac{3}{8}, \frac{-7}{10}\right)$ and $\left(\frac{-7}{8}, \frac{-3}{10}\right)$

Section – D

- Note: (i) This section contains 2 questions, each with two alternatives.
 (ii) Answer both the questions choosing either of the alternatives.
 (iii) Each question carries 10 marks.

2 × 10 = 20

46. (a) Draw a circle of radius 3 cm. From an external point 7 cm away from its centre, construct the pair of tangents to the circle and measure their lengths.

(OR)

(b) Construct a $\triangle ABC$ in which the base $BC = 5 \text{ cm}$, $\angle BAC = 40^\circ$ and the median from A to BC is 6 cm. Also, measure the length of the altitude from A .

47. (a) Solve the equation graphically. $(2x + 1)(x - 3) = 0$.

(OR)

(b) A bus travels at a speed of 40 km / hr. Write the distance-time formula and draw the graph of it. Hence, find the distance travelled in 3 hours.

Model Question Paper - 5

Time: 2.30 Hrs.]

[Maximum marks: 100

General instructions:

- (i) This question paper consists of four sections. Read the note carefully under each section before answering them.
- (ii) The rough work should be shown at the bottom of the pages of the answer book.
- (iii) Calculator and other electronic devices are not permitted.

Section – A

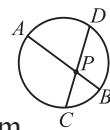
Note: (i) Answer all the 15 questions.

(ii) Each question contains four options. Choose the most suitable answer from the four alternatives.

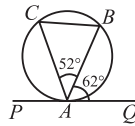
(iii) Each question carries 1 mark

15 × 1 = 15

1. If $f(x) = x^2 + 5$, then $f(-4) =$
(A) 26 (B) 21 (C) 20 (D) -20
2. If the n^{th} term of an A.P. is $t_n = 3 - 5n$, then the sum of the first n terms is
(A) $\frac{n}{2}[1 - 5n]$ (B) $n(1 - 5n)$ (C) $\frac{n}{2}(1 + 5n)$ (D) $\frac{n}{2}(1 + n)$
3. Find the common ratio of the sequence 4, -2, +1, -7,
(A) 4 (B) -2 (C) $\frac{1}{2}$ (D) $-\frac{1}{2}$
4. 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) $\frac{a+b}{2c}$
5. $\sqrt{\frac{81x^4y^6z^8}{64w^{12}s^{14}}} =$
(A) $\left| \frac{9x^4y^6z^8}{8w^{12}s^{14}} \right|$ (B) $\left| \frac{9x^2y^3z^4}{8w^{12}s^{14}} \right|$ (C) $\left| \frac{9x^2y^3z^4}{8w^6s^7} \right|$ (D) $\left| \frac{8w^6s^7}{9x^2y^3z^4} \right|$
6. If $(5 \ x \ 1) \begin{pmatrix} 2 \\ -1 \\ 3 \end{pmatrix} = (20)$, then the value of x is
(A) 7 (B) -7 (C) $\frac{1}{7}$ (D) 0
7. The slope of the straight line $7y - 2x = 11$ is equal to
(A) $-\frac{7}{2}$ (B) $\frac{7}{2}$ (C) $\frac{2}{7}$ (D) $-\frac{2}{7}$
8. Mid point of the line segment joining the points (1, -1) and (-5, 3) is
(A) (-2, 1) (B) (2, -1) (C) (-2, -1) (D) (-1, -2)
9. In the adjoining figure, chords AB and CD intersect at P .
If $AB = 16$ cm, $PD = 8$ cm, $PC = 6$ and $AP > PB$, then $AP =$
(A) 8 cm (B) 4 cm (C) 12 cm (D) 6 cm



10. In the figure PQ is a tangent, $\angle BAQ = 62^\circ$ and $\angle BAC = 52^\circ$, then $\angle ACB =$
 (A) 64° (B) 90°
 (C) 54° (D) 62°



11. $\frac{1 + \tan^2 \theta}{1 + \cot^2 \theta} =$
 (A) $\cos^2 \theta$ (B) $\tan^2 \theta$ (C) $\sin^2 \theta$ (D) $\cot^2 \theta$
12. $\sin \theta \cos \theta (\tan \theta + \cot \theta) =$
 (A) 0 (B) 2 (C) 1 (D) $\tan \theta$
13. If the radius of a sphere is half of the radius of another sphere, then their respective volumes are in the ratio
 (A) 1 : 8 (B) 2 : 1 (C) 1 : 2 (D) 8 : 1
14. For any collection of n items, $(\sum x) - \bar{x} =$
 (A) $n\bar{x}$ (B) $(n - 2)\bar{x}$ (C) $(n - 1)\bar{x}$ (D) 0
15. A fair die is thrown once. The probability of getting a prime or composite number is
 (A) 1 (B) 0 (C) $\frac{5}{6}$ (D) $\frac{1}{6}$

Section – B

Note: (i) Answer 10 questions

(ii) Answer any 9 questions from the first 14 questions. Question no. 30 is compulsory.

(iii) Each question carries 2 marks

10 × 2 = 20

16. For the given sets $A = \{-10, 0, 1, 9, 2, 4, 5\}$ and $B = \{-1, -2, 5, 6, 2, 3, 4\}$, verify that the set intersection is commutative
17. A function $f: [-3, 7) \rightarrow \mathbb{R}$ is defined as follows

$$f(x) = \begin{cases} 4x^2 - 1; & -3 \leq x < 2 \\ 3x - 2; & 2 \leq x \leq 4. \\ 2x - 3; & 4 < x < 7 \end{cases}$$
 Find $f(1) - f(-3)$
18. If a, b, c are in A.P. then prove that $(a - c)^2 = 4(b^2 - ac)$.
19. Solve the system of equations by elimination method. $x + 2y = 7$, $x - 2y = 1$
20. Find the product of the matrices, if exists, $\begin{pmatrix} 3 & -2 \\ 5 & 1 \end{pmatrix} \begin{pmatrix} 4 & 1 \\ 2 & 7 \end{pmatrix}$
21. Matrix A shows the weight of four boys and four girls in kg at the beginning of a diet programme to lose weight. Matrix B shows the corresponding weights after the diet programme. $A = \begin{pmatrix} 35 & 40 & 28 & 45 \\ 42 & 38 & 41 & 30 \end{pmatrix} \begin{matrix} \text{Boys} \\ \text{Girls} \end{matrix}$, $B = \begin{pmatrix} 32 & 35 & 27 & 41 \\ 40 & 30 & 34 & 27 \end{pmatrix} \begin{matrix} \text{Boys} \\ \text{Girls} \end{matrix}$ Find the weight loss of the Boys and Girls.
22. Find the point which divides the line segment joining the points (3, 5) and (8, 10) internally in the ratio 2 : 3.

23. In $\triangle PQR$, $AB \parallel QR$. If AB is 3 cm, PB is 2cm and PR is 6 cm, then find the length of QR .
24. A ramp for unloading a moving truck, has an angle of elevation of 30° . If the top of the ramp is 0.9 m above the ground level, then find the length of the ramp.
25. Prove the following identity $\frac{\sin \theta}{1 - \cos \theta} = \operatorname{cosec} \theta + \cot \theta$.
26. The radii of two right circular cylinders are in the ratio of 3 : 2 and their heights are in the ratio 5 : 3. Find the ratio of their curved surface areas.
27. The radius of a spherical balloon increases from 7 cm to 14 cm as air is being pumped into it. Find the ratio of volumes of the balloon in the two cases.
28. Find the range and the coefficient of range of 43, 24, 38, 56, 22, 39, 45.
29. An integer is chosen from the first twenty natural numbers. What is the probability that it is a prime number?
30. (a) Find the square root of $(x + 1)^6 + \frac{1}{(x + 1)^6} + 2$. (OR)
 (b) Find the equation of the straight line whose angle of inclination is 60° and y -intercept is $\frac{1}{\sqrt{3}}$.

Section – C

Note: (i) Answer 9 questions

(ii) Answer any 8 questions from the first 14 questions. Question no. 45 is compulsory.

(iii) Each question carries five marks

9 × 5 = 45

31. An advertising agency finds that, of its 170 clients, 115 use Television, 110 use Radio and 130 use Magazines. Also, 85 use Television and Magazines, 75 use Television and Radio, 95 use Radio and Magazines, 70 use all the three. Draw Venn diagram to represent these data. Find
- how many use only Radio?
 - how many use only Television?
 - how many use Television and magazine but not radio?
32. A function $f : [1, 6) \rightarrow \mathbb{R}$ is defined as follows $f(x) = \begin{cases} 1 + x, & 1 \leq x < 2 \\ 2x - 1, & 2 \leq x < 4 \\ 3x^2 - 10, & 4 \leq x < 6 \end{cases}$
- Here, $[1, 6) = \{ x \in \mathbb{R} : 1 \leq x < 6 \}$ Find the value of
- $f(5)$
 - $f(3)$
 - $f(1)$
 - $f(2) - f(4)$
 - $2f(5) - 3f(1)$
33. The ratio of the sums of first m and first n terms of an arithmetic series is $m^2 : n^2$ show that the ratio of the m th and n th terms is $(2m - 1) : (2n - 1)$
34. Solve $3(2x + y) = 7xy$; $3(x + 3y) = 11xy$ using elimination method
35. Find the square root of the following: $(6x^2 + 5x - 6)(6x^2 - x - 2)(4x^2 + 8x + 3)$
36. A car left 30 minutes later than the scheduled time. In order to reach its destination 150 km away in time, it has to increase its speed by 25 km/hr from its usual speed. Find its usual speed.

37. Find X and Y if $2X + 3Y = \begin{pmatrix} 2 & 3 \\ 4 & 0 \end{pmatrix}$ and $3X + 2Y = \begin{pmatrix} 2 & -2 \\ -1 & 5 \end{pmatrix}$.
38. Find the area of the quadrilateral formed by the points $(-4, -2)$, $(-3, -5)$, $(3, -2)$ and $(2, 3)$.
39. Find the equations of the straight lines each passing through the point $(6, -2)$ and whose sum of the intercepts is 5.
40. State and prove Angle Bisector Theorem.
41. A girl standing on a lighthouse built on a cliff near the seashore, observes two boats due East of the lighthouse. The angles of depression of the two boats are 30° and 60° . The distance between the boats is 300 m. Find the distance of the top of the lighthouse from the sea level.
42. A cylindrical shaped well of depth 20 m and diameter 14 m is dug. The dug out soil is evenly spread to form a cuboid-platform with base dimension $20 \text{ m} \times 14 \text{ m}$. Find the height of the platform.
43. The time (in seconds) taken by a group of people to walk across a pedestrian crossing is given in the table below.

Time (in sec)	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30
No. of people	4	8	15	12	11

Calculate the variance and standard deviation of the data.

44. The probability that a new car will get an award for its design is 0.25, the probability that it will get an award for efficient use of fuel is 0.35 and the probability that it will get both the awards is 0.15. Find the probability that
- (i) it will get atleast one of the two awards (ii) it will get only one of the awards.
45. (a) Find the sum upto n terms of the series $0.7 + 0.97 + 0.997 + \dots$. (OR)
- (b) A solid metallic cylinder of diameter 4cm and height 45cm. is melted and recast into identical spherical shots of radius 3cm each. Find the number of spherical shots.

Section – D

Note: (i) This section contains two questions, each with two alternatives.

(ii) Answer both the questions choosing either of the alternatives.

(iii) Each question carries ten marks

2 × 10 = 20

46. (a) Construct a $\triangle ABC$ in which $BC = 5.5 \text{ cm.}$, $\angle A = 60^\circ$ and the median AM from the vertex A is 4.5 cm.
- (OR)
- (b) Construct a cyclic quadrilateral $ABCD$, given $AB = 6 \text{ cm}$, $\angle ABC = 70^\circ$, $BC = 5 \text{ cm}$ and $\angle ACD = 30^\circ$.
47. (a) Draw the graph of $y = x^2 + 2x - 3$ and hence find the roots of $x^2 - x - 6 = 0$.
- (OR)

(b) The following table gives the cost and number of notebooks bought.

No. of note books x	2	4	6	8	10	12
Cost ₹ y	30	60	90	120	150	180

Draw the graph and hence (i) Find the cost of seven note books.

(ii) How many note books can be bought for ₹ 165.