

Choose the correct answer,

- Given $f(x) = (-1)^x$ is a function from N to Z . Then the range of f is
a) $\{1\}$ b) N c) $\{1, -1\}$ d) Z
- If the third term of a G.P is 2, then the product of first 5 terms is
a) 5^2 b) 2^5 c) 10 d) 15
- The common ratio of the G.P. a^{m-n}, a^m, a^{m+n} is a) a^m b) a^{-m} c) a^n d) a^{-n}
- 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
- The square root of $49(x^2 - 2xy + y^2)^2$ is a) $7|x-y|$ b) $7(x+y)(x-y)$ c) $7(x+y)^2$ d) $7(x-y)^2$
- If $A = (1 \ -2 \ 3)$ and $B = \begin{pmatrix} -1 \\ 2 \\ -3 \end{pmatrix}$ then $A+B =$ a) $(0, 0, 0)$ b) $\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$ c) -14 d) not defined
- If $(1, 2), (4, 6), (x, 6)$ and $(3, 2)$ are the vertices of a parallelogram taken in order, then the value of x is
a) 6 b) 2 c) 1 d) 3
- The equation of a straight line having slope 3 and y -intercept -4 is
a) $3x - y - 4 = 0$ b) $3x + y - 4 = 0$ c) $3x - y + 4 = 0$ d) $3x + y + 4 = 0$
- If a straight line intersects the sides AB and AC of a $\triangle ABC$ at D and E respectively and is parallel to BC , then $\frac{AE}{AC} =$ a) $\frac{AD}{DB}$ b) $\frac{AD}{AB}$ c) $\frac{DE}{BC}$ d) $\frac{AD}{EC}$
- AB and CD are two chords of a circle which when produced to meet at a point P such that $AB = 5, AP = 8$ and $CD = 2$, then $PD =$
a) 12 b) 5 c) 6 d) 4
- If $\tan \theta = \frac{a}{x}$ then the value of $\frac{x}{\sqrt{a^2 + x^2}} =$ a) $\cos \theta$ b) $\sin \theta$ c) $\operatorname{cosec} \theta$ d) $\sec \theta$
- $\frac{1 + \tan^2 \theta}{1 + \cot^2 \theta} =$ a) $\cos^2 \theta$ b) $\tan^2 \theta$ c) $\sin^2 \theta$ d) $\cot^2 \theta$
- If the volume of a sphere is $\frac{9}{16}\pi$ cu.cm, then its radius is a) $\frac{4}{3}$ cm b) $\frac{3}{4}$ cm c) $\frac{3}{2}$ cm d) $\frac{2}{3}$ cm
- 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
- Probability of sure event is a) 1 b) 0 c) 100 d) 0.1

SECTION - II

Note : (i) Answer 10 question. (ii) Question number 30 is compulsory. Select any 9 questions from the first 14 questions. 10 x 2 = 20

- Verify the commutative property of set intersection for $A = \{l, m, n, o, 2, 3, 4, 7\}$, and $B = \{2, 5, 3, -2, m, n, o, p\}$
- Let $x = \{1, 2, 3, 4\}$. Examine whether each of the relations given below is a function from X to X or not. Explain $g = \{(3, 1), (4, 2), (2, 1)\}$.
- How many two digit numbers are divisible by 13?
- If α and β are the roots of equation $3x^2 - 6x + 4 = 0$ find the value of $\alpha^2 + \beta^2$
- Construct a 2×3 matrix $A = (a_{ij})$ whose elements are given by $a_{ij} = |2i - 3j|$.
- Prove that $A = \begin{pmatrix} 5 & 2 \\ 7 & 3 \end{pmatrix}$, $B = \begin{pmatrix} 3 & -2 \\ -7 & 5 \end{pmatrix}$ are inverses to each other under matrix multiplication.
- If the centroid of a triangle is at $(2, 3)$ and two of its vertices are $(-9, 8)$, and $(10, 7)$ then find the third vertex of the triangle.
- Show that the straight lines $3x + 2y - 12 = 0$, and $6x + 4y + 8 = 0$ are parallel.
- 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. Prove the following identities. $\frac{\sin(90^\circ - \theta)}{1 + \sin \theta} + \frac{\cos \theta}{1 - \cos(90^\circ - \theta)} = 2 \sec \theta$.
26. A girl of height 200cm stands in front of a lamp-post and casts a shadow of length $200\sqrt{3}$ cm on the ground. Find the angle of elevation of the top of the lamp-post.
27. A hollow sphere in which a circus motorcyclist performs his stunts, has an inner diameter of 7m. Find the area available to the motorcyclist for riding ($\pi = 22/7$)
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. Find the probability that a leap year selected at random will have 53 Fridays.
30. Solve the following systems of equations using cross elimination method $x + 2y = 7$, $x - 2y = 1$ (OR)
The volume of a cone with circular base is 216π cu.cm. If the base radius is 9cm, then find the height of the cone.

SECTION - III

Note : (i) Answer 9 questions. (ii) Question number 45 is compulsory. Select any 8 questions from the first 14 questions. 9 X 5 = 45

31. In a town 85% of the people speak English, 40% speak Tamil and 20% speak Hindi. Also 42% speak English and Tamil, 23% speak Tamil and Hindi and 10% speak English and Hindi, find the percentage of people who can speak all the three languages.
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. The sum of three consecutive terms in an A.P is 6 and their products is 120. Find the three numbers.
34. Find the sum of $1^2 + 3^2 + 5^2 + \dots + 51^2$
35. Factorize $2x^3 + 7x^2 + 2x - 3$.
36. One year ago, a man was 8 times as old as his son. Now his age is equal to the square of his son's age. Find their present ages.
37. If $A = \begin{pmatrix} 3 & 2 \\ -1 & 4 \end{pmatrix}$, $B = \begin{pmatrix} -2 & 5 \\ 6 & 7 \end{pmatrix}$, and $C = \begin{pmatrix} 1 & 1 \\ -5 & 3 \end{pmatrix}$ verify that $A(B + C) = AB + AC$.
38. If $P(x, y)$ is any point on the line segment joining the points $(a, 0)$, and $(0, b)$ then prove that $\frac{x}{a} + \frac{y}{b} = 1$ where $a, b \neq 0$.
39. If the vertices of a ΔABC are $A(-4, 4)$, $B(8, 4)$ and $C(8, 10)$. Find the equation of the straight line along the median from the vertex A .
40. State and prove the pythagoras theorem.
41. From the top of a 60m tall tower, 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.
42. If the total surface area of a solid right circular cylinder is 880 sq.cm and its radius is 7cm, find its curved surface area. (Take $\pi = 22/7$)
43. Prove that the standard deviation of the first n natural numbers is $\sigma = \sqrt{\frac{n^2 - 1}{12}}$.
44. A box contains 10 white, 6 red and 10 black balls. A ball is drawn at random. Find the probability that the ball drawn is white or red.
45. Find the square root of $(x^2 - 25)(x^2 + 8x + 15)(x^2 - 2x - 15)$. (OR)
A cup is in the form of a hemisphere surmounted by a cylinder. The height of the cylindrical portion is 8 cm and the total height of the cup is 11.5 cm. Find the total surface area of the cup (Take $\pi = 22/7$)

SECTION - IV

2 X 10 = 20

- Note : Answer both the questions choosing either of the alternatives.
46. (a) Construct a ΔABC such that $BC = 5$ cm, $\angle A = 45^\circ$ and the median from A to BC is 4 cm (OR)
(b) Construct a cyclic quadrilateral PQRS with $PQ = 4$ cm, $\angle P = 100^\circ$, $\angle PQS = 40^\circ$ and $\angle SQR = 70^\circ$.
47. (a) Draw the graph of $y = 2x^2 + x - 6$ and hence solve $2x^2 + x - 10 = 0$ (OR)
(b) A bank gives 10% SI on deposits for senior citizens. Draw the graph for the relation between the sum deposited and the interest earned for one year. Hence find
(i) The interest on the deposit of Rs. 650
(ii) The amount to be deposited to earn an interest of Rs. 45.