Score

**Answer any 6 questions from 1 to 8. Each carries 3 scores.** **(6×3=18)**

1. i) If A and B are two sets, then $A \cap (A \cup B)$ equals **(1)**

   a) B  b) A  c) $\phi$  d) $A \cap B$

   ii) Which of the following a singleton set ? **(1)**

   a) $\{x : |x| = 5, x \in N\}$

   b) $\{x : |x| = 6, x \in Z\}$

   c) $\{x : x^2 = 7, x \in R\}$

   d) $\{x : x^2 + 2x + 1 = 0, x \in R\}$

   iii) Draw a Venn diagram represent the set $A - (B \cup C)$. **(1)**

2. The relation R given by $R = \left\{(x, y) : y = x + \frac{6}{x}, x, y \in \mathbb{N}, \text{and } x < 6\right\}$

   i) Write R in roster form. **(1)**

   ii) Write the domain and Range of R. **(1)**

   iii) If two sets A and B having 44 elements in common then number of elements common to $A \times B$ and $B \times A$ is _____ **(1)**

   a) 44  b) 1900  c) 1936  d) 1976

3. i) $\cos 1° \cos 2° \cos 3° \ldots \cos 179°$ is _____ **(1)**

   a) $\frac{1}{\sqrt{2}}$  b) 0  c) 1  d) $-1$

   ii) The minute hand of a watch is 1.5 cm long. How far does its tip move in 40 minute ? (use $\pi = 3.14$) **(2)**

4. i) How many 4 digit numbers can be formed using the digits 0, 1, 2, 3, 4, 5 no digit being repeated ? **(1)**

   ii) Find the value of n.

   $$\frac{{}^{n}P_4}{{}^{(n-1)}P_4} = \frac{5}{3}, n > 4$$ **(2)**

Score

5. i) The third term of a geometric progression is 4. Find the product of first 5 terms. (1½)

ii) Which term of the G.P. 2, 8, 32, ... is 32768 ? (1½)

6. i) The slope of a straight line which does not intersect x-axis is _____ (1)

ii) Find the equation of a line passing through (– 3, 5) and perpendicular to the line through the points (1, 0) and (– 4, 1). (2)

7. i) Let E be the ellipse $\frac{x^2}{9}+\frac{y^2}{4}=1$ and C be the circle $x^2+y^2=9$. Let P(1, 2) and Q(2, 1) are two points. Then which of the following is correct ? (1)

a) Q lies outside both C and E

b) Q lies inside C but outside E

c) P lies inside both C and E

d) P lies inside C but outside E

ii) Find the coordinate of the focus and equation of the directrix of the parabola $x^2+9y=0$. (2)

8. i) If $\lim_{x\to 2}\frac{x^n-2^n}{x-2}=80$, then n = _____ (1)

ii) If $f(x)=\begin{cases}2x+3, & x\le 0\\ 3(x+1), & x>0\end{cases}$

find $\lim_{x\to 0} f(x)$ and $\lim_{x\to 1} f(x)$. (2)

Score

**Answer any 6 questions from 9 to 16. Each carries 4 scores.** (6×4=24)

**9.** i) $A = \{1, 2, 3, 4, 5\}$

Find the number of subset of A. Which contain exactly two elements ? (1)

ii) $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$, verify that $(A \cup B)' = A' \cap B'$. (3)

**10.** i) Let $f = \{(1, 1), (2, 3), (0, -1), (-1, 3)\}$ be a function from $\mathbb{Z}$ to $\mathbb{Z}$ define $f(x) = ax + b$, for some integer a, b. Determine a, b. (2)

ii) Draw the graph of the function $f(x) = \begin{cases} 1-x, & x < 0 \\ 1, & x = 0 \\ x+1, & x > 0 \end{cases}$. Write the range of f(x). (2)

**11.** i) The complex number $z = \frac{1-i}{1+i}$ lies in (1)

a) 1st quadrant

b) 2nd quadrant

c) x-axis

d) y-axis

ii) Let $Z_1 = 2 - i$ $\quad Z_2 = -2 + i$

Find $\left| \frac{Z_1 Z_2}{\bar{Z}_1} \right|$. (3)

Score

**12.** Solve the inequality $\frac{x+11}{x-3} > 0$ for real x. **(4)**

**13.** i) ${}^{n}C_0 + {}^{n}C_1 + {}^{n}C_2 + \ldots + {}^{n}C_n =$ _____ **(1)**

ii) Using binomial theorem, expand $\left(\frac{2}{x} - \frac{x}{2}\right)^5$. **(3)**

**14.** The sum of first three terms of a G.P. is 16 and sum of the next three terms is 128. Determine the 1st term, the common ratio and the sum to n terms. **(4)**

**15.** A straight line L through the point $(3, -2)$ is inclined at an angle $60°$ with the line $\sqrt{3}x + y = 1$. Find the equation of line L. **(4)**

**16.** i) Distance of the point (a, b, c) from YOZ plane is _____ **(1)**

ii) The point $(2, -3, 4)$ lies in _____ octant. **(1)**

a) XOYZ

b) X′OYZ′

c) XOY′Z

d) XOY′Z′

iii) A line is parallel to XY plane if all the points on the line have equal _____ coordinate. **(1)**

iv) L is the foot of the perpendicular drawn from a point P(6, 7, 8) on the XZ plane. What is the coordinate of the point L ? **(1)**

Score

**Answer any 3 questions from 17 to 20. Each carries 6 scores.** (3×6=18)

**17.** i) If $\cos x = \frac{-4}{5}$ and $x \in [0, \pi]$, find the value of $\cos\frac{x}{2}$. (2)

ii) Prove that $\cos 24° + \cos 55° + \cos 125° + \cos 204° + \cos 300° = \frac{1}{2}$. (2)

iii) Prove that $\frac{\sin x - \sin 3x}{\sin^2 x - \cos^2 x} = 2\sin x$. (2)

**18.** i) In how many ways can one select a cricket team of eleven from 17 players in which only 5 person can bowl if each cricket team of 11 must include exactly 4 bowlers ? (2)

ii) Determine the number of 5 card combination out of a deck of 52 cards if each selection of 5 card has exactly one king. (2)

iii) In how many ways can all letters of the word ASSASSINATION be arranged so that all vowels occur together ? (2)

**19.** i) Find the coordinate of the foci, vertices, the eccentricity length of latus rectum of the hyperbola $5y^2 - 9x^2 = 36$. (3)

ii) If the distance between the foci of an ellipse is half of the length of latus rectum. Find the eccentricity of the ellipse. (3)

**20.** Find the derivative of

i) $\frac{a}{x^4} - \frac{b}{x^2} + \cos x$, a and b are constants. (2)

ii) $\frac{x^5 - \cos x}{\sin x}$. (2)

iii) $x^{-4}(3 - 4x^{-5})$. (2)