



Time: 1.30 Hrs.

Standard 11 MATHEMATICS

Marks: 50

PART - I

Choose the best answer:

10 × 1 = 10

- 1) If $A = \{(x, y) : y = \sin x, x \in \mathbb{R}\}$ and $B = \{(x, y) : y = \cos x, x \in \mathbb{R}\}$ then $A \cap B$ contains
 - a) No element
 - b) infinitely many elements
 - c) only one element
 - d) cannot be determined
- 2) The number of relations on a set containing 3 elements is
 - a) 9
 - b) 81
 - c) 512
 - d) 1024
- 3) The rule $f(x) = x^2$ is a bijection if the domain and co-domain are given by
 - a) \mathbb{R}, \mathbb{R}
 - b) $\mathbb{R}, (0, \infty)$
 - c) $(0, \infty), \mathbb{R}$
 - d) $[0, \infty), [0, \infty)$
- 4) Let $X = \{1, 2, 3, 4\}$ and $R = \{(1, 1), (1, 2), (1, 3), (2, 2), (3, 3), (2, 1), (3, 1), (1, 4), (4, 1)\}$. Then R is
 - a) reflexive
 - b) symmetric
 - c) transitive
 - d) equivalence
- 5) The solution set of the following inequality $|x-1| \geq |x-3|$ is
 - a) $[0, 2]$
 - b) $[2, \infty)$
 - c) $(0, 2)$
 - d) $(-\infty, 2)$
- 6) If $\frac{kx}{(x+2)(x-1)} = \frac{2}{x+2} + \frac{1}{x-1}$, then the value of k is
 - a) 1
 - b) 2
 - c) 3
 - d) 4
- 7) The value of $\log_3 11 \cdot \log_{11} 13 \cdot \log_{13} 15 \cdot \log_{15} 27 \cdot \log_{27} 81$ is
 - a) 1
 - b) 2
 - c) 3
 - d) 4
- 8) $\left(1 + \cos \frac{\pi}{8}\right) \left(1 + \cos \frac{3\pi}{8}\right) \left(1 + \cos \frac{5\pi}{8}\right) \left(1 + \cos \frac{7\pi}{8}\right) =$
 - a) $\frac{1}{8}$
 - b) $\frac{1}{2}$
 - c) $\frac{1}{\sqrt{3}}$
 - d) $\frac{1}{\sqrt{2}}$
- 9) If $\tan 40^\circ = \lambda$, Then $\frac{\tan 140^\circ - \tan 130^\circ}{1 - \tan 140^\circ \tan 130^\circ} =$
 - a) $\frac{1 - \lambda^2}{\lambda}$
 - b) $\frac{1 + \lambda^2}{\lambda}$
 - c) $\frac{1 + \lambda^2}{2\lambda}$
 - d) $\frac{1 - \lambda^2}{2\lambda}$
- 10) $\cos 1^\circ + \cos 2^\circ + \cos 3^\circ + \dots + \cos 179^\circ =$
 - a) 0
 - b) 1
 - c) -1
 - d) 89

PART - II

Answer ANY 4 of the following: (16 is compulsory)

4 × 2 = 8

- 11) If $n(A) = 10$ and $n(A \cap B) = 3$, find $n((A \cap B)' \cap A)$.
- 12) Let f and g be the two functions from \mathbb{R} to \mathbb{R} defined by $f(x) = 3x - 4$ and $g(x) = x^2 + 3$. Find $g \circ f$ and $f \circ g$.
- 13) Solve $3|x-2| + 7 = 19$ for x.
- 14) If $x^2 + x + 1$ is a factor of the polynomial $3x^3 + 8x^2 + 8x + a$, then find the value of a.
- 15) Find the value of: $\operatorname{cosec}(-1410^\circ)$

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- 16) Eliminate θ from $a \cos \theta = b$ and $c \sin \theta = d$, where a, b, c, d are constants.

PART - III**Answer ANY 4 of the following: (22 is compulsory)****4 × 3 = 12**

- 17) In the set Z of integers, define mRn if $m-n$ is divisible by 7. Prove that R is an equivalence relation.

- 18) Find the range of the function $\frac{1}{2 \cos x - 1}$.

- 19) Resolve into partial fraction $\frac{1}{x^2 - a^2}$.

- 20) Find the value of $\sin 34^\circ + \cos 64^\circ - \cos 40^\circ$.

- 21) If $A+B = 45^\circ$, show that $(1+\tan A)(1+\tan B) = 2$.

- 22) Solve $2x^2+x-15 \leq 0$.

PART - IV**Answer the following questions:****4 × 5 = 20**

- 23) If $f : R \rightarrow R$ is defined by $f(x) = 3x-5$, prove that f is a bijection and find its inverse. **(OR)**

A manufacturer has 600 litres of a 12 percent solution of acid. How many litres of a 30 percent acid solution must be added to it so that the acid content in the resulting mixture will be more than 15 percent but less than 18 percent.

- 24) Solve $\frac{x-1}{x-3} < 3$. **(OR)**

Prove $\log \frac{75}{16} - 2 \log \frac{5}{9} + \log \frac{32}{243} = \log 2$.

- 25) If $A+B+C = 180^\circ$, prove that $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$. **(OR)**

If $\theta + \phi = \alpha$ and $\tan \theta = k \tan \phi$, then prove that

$$\sin(\theta - \phi) = \frac{k-1}{k+1} \sin \alpha.$$

- 26) Write the values of f at $-3, 5, 2, -1, 0$ if

$$f(x) = \begin{cases} x^2 + x - 5 & \text{if } x \in (-\infty, 0) \\ x^2 + 3x - 2 & \text{if } x \in (3, \infty) \\ x^2 & \text{if } x \in (0, 2) \\ x^2 - 3 & \text{otherwise} \end{cases}$$

(OR)

If $\sin x = \frac{4}{5}$ (in I quadrant) and $\cos y = \frac{-12}{13}$ (in II quadrant), then find (i) $\sin(x-y)$, (ii) $\cos(x-y)$.