Roll No. .....

1122-B

Class 11th Quarterly Examination 2022-23

Mathematics-150

(English Medium)

[Total No. of Questions: 23] [Total No. of Printed Pages: 08]

[Time: 03 Hours] [Maximum Marks: 80]

Instructions-

(1) All the question are compulsory.

(2) Allotted marks for the questions are mentioned against them.

(3) Questions from Q. 01 to Q. 05 are objective type questions.

(4) The internal choice has been provided in each question from Q. 06 to Q. 23.

Q.1 Choose the correct option - [1×6=6]

(1) If A = {1, 2, 3, 4} and B = {3, 4, 5, 6}, then the value of A∩B is -

(a) {1, 2, 3, 4, 5, 6} (b) {3, 4, 5, 6}

(c) {1, 2, 3, 4} (d) {3, 4}

(2) The function f (x) = x is called -

(a) Identity function (b) Constant function

(c) Modulus function (d) Signum function

(3) If (a+1, b–2) = (3, 1), then the values of a and b are respectively –

(a) 2, 3 (b) –2, –3

(c) 2, –3 (d) –2, 3

(4) The range of the function y = cos x is -

(a) (-1, 1) (b) [-1, 1]

(c) $(-\infty, \infty)$ (d) $[0, \pi]$

(5) The value of i^{-8} is –

(a) –1 (b) 1

(c) $\sqrt{-1}$ (d) i

(6) If 4x + i (3x - y) = 3 + i (-6), where x and y are real numbers, then the values of x and y are respectively -

(a) $\frac{3}{4}$ and $\frac{33}{4}$ (b) $\frac{-3}{4}$ and $\frac{-33}{4}$

(c) $\frac{-3}{4}$ and $\frac{33}{4}$ (d) $\frac{3}{4}$ and $\frac{-33}{4}$

Q.2 Fill in the blanks - [1×7=7]

(1) $A \cup \phi$ = ...

(2) If either A or B is an infinite set, then the set $A \times B$ is .....

(3) If $\cos \alpha = \frac{1}{2}$, then $\cos 2\alpha$ = ...

(4) Conjugate of the complex number $-3 + i$ is .....

(5) Those values of x which make the given inequality a true statement are called ..... of the inequality.

(6) $ax + by < c$ is a ..... inequality. (strict/slack)

(7) A set which does not contain any element is called ..... set.

Q.3 Match the correct column – [1×6=6]

Column (A)	**Column (B)**
(1) $A' \cup B'$	(a) $\frac{\pi}{4}$ c
(2) $(A \cup B)'$	(b) ϕ
(3) $A \times \phi$	(c) $(A \cap B)'$
(4) 45°	(d) $A' \cap B'$
(5) $\sin(-\theta)$	(e) $\sec \theta$
(6) $\text{cosec}(90 - \theta)$	(f) $-\sin \theta$

Q.4 Answer in one word/sentence - [1×7=7]

(1) If the set S has 5 elements, then how many subsets will the set S have?

(2) If a function is defined by $f(x) = x^3 - 1$, then find the value of $f(-2)$.

(3) How many seconds are there in a minute?

(4) Express $\frac{1}{i^5}$ in terms of a + ib.

(5) Find the value of 5!.

(6) Find the value of ${}^5P_2$.

(7) How many permutations can be made from the letters of the word 'ROSE'?

Q.5 Write True/False - [1×6=6]

(1) $\phi \subset A$, is true, where ϕ is an empty set and A is any finite set.

(2) $A \times A \times A = \{(a, b, c) : a, b, c \in A\}$. Here (a, b, c) is called a ordered triplet.

(3) One complete revolution = 2π radian.

(4) $i = \sqrt{-1}$

(5) $2x + 3y \leq 4$ is a linear inequality.

(6) Both sides of an inequality can be multiplied (or divided) by the same positive number. But on multiplying (or dividing) both the sides by the same negative number, the signs of the inequality change accordingly.

Q.6 If f, g : R → R are defined by f(x) = x + 1, g(x) = 2x – 3 respectively, then find f.g and $\frac{f}{g}$. [2]

OR

If f(x) = x^2 and g(x) = 2x + 1, then find (f + g) (x) and (f – g) (x).

Q.7 If A = {1, 2, 3, 4, 5, 6}. Define a relation R from A to A by R = {(x, y) : y = x +1}. Depict the relation using an arrow diagram. [2]

OR

Let N be the set of natural numbers and the relation R be defined on N such that R = {(x, y) : y = 2x, x, y ∈ N}. What is the range of R? [2]

Q.8 Convert 6 radian into degree measure.

OR

Find the value of tan15°.

Q.9 A chord of a circle, whose diameter is 40 cm, is of length 20 cm, then find the length of its corresponding smaller arc. [2]

OR

If a wheel makes 360 revolutions in a minute, how many radians of an angle will it make in one second?

Q.10 Find the multiplicative inverse of z = 4 – 3i. [2]

OR

Express $\frac{5+\sqrt{2}i}{1-\sqrt{2}i}$ in terms of a + ib.

Q.11 Find the modulus of the complex number $\frac{1+i}{1-i}$. [2]

OR

Express $(5 - 3i)^3$ in terms of a + ib.

Q.12 Solve: $30x < 200$, when x is an integer. [2]

OR

Solve: $4x + 3 < 6x + 7$.

Q.13 Solve: $\frac{x}{3} > \frac{x}{2} + 1$. [2]

OR

Solve: $\frac{x}{2} \geq \frac{(5x - 2)}{3} - \frac{(7x - 3)}{5}$.

Q.14 How many 3-digit numbers can be formed from the digits 1, 2, 3, 4 and 5, if repetition of digits is not allowed? [2]

OR

If $\frac{1}{8!} + \frac{1}{9!} = \frac{x}{10!}$, then find x.

Q.15 Find the value of n if ${}^nP_5 = 42\ {}^nP_3$, $n > 4$. [2]

OR

In a committee of 8 persons, in how many ways can we choose a chairman and a vice-chairman, assuming that one person cannot hold more than one post?

Q.16 The set {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} is a universal set of which A = {2, 4, 6, 8, 10} and B = {4, 6} are subsets. Show them by Venn diagram. [3]

OR

If U = {1, 2, 3, 4, 5}, A = {2, 3}, and B = {4, 5}, then find $(A \cup B)'$ and A – B.

Q.17 A survey of 600 students of a school found that 150 students drink tea, 225 students drink coffee and 100 students drink both tea and coffee. Find how many students neither drink tea nor drink coffee. [3]

OR

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

Q.18 IQ of a person is given by the formula. $IQ=\frac{MA}{CA} \times 100$,

where MA is mental age and CA is chronological age. If $80 \leq IQ \leq 140$ for a group of 12 years old children, find the range of their mental age. [3]

OR

Find such pairs of consecutive odd numbers in which both the numbers are greater than 10, and their sum is less than 40.

Q.19 Determine the number of combinations formed by taking 5 cards from a pack of 52 cards, if each pack contains exactly one ace. [3]

OR

Find the value of r if $5\ {}^{4}P_{r} = 6\ {}^{5}P_{r-1}$.

Q.20 If $\cos x = -\frac{3}{5}$ and x lies in third quadrant, then find the values of other five trigonometric ratios. [4]

OR

Prove that: $2\sin^2\frac{\pi}{6} + \operatorname{cosec}^2\frac{7\pi}{6}\cos^2\frac{\pi}{3} = \frac{3}{2}$.

Q.21 Prove that: $\frac{\tan\left(\frac{\pi}{4}+x\right)}{\tan\left(\frac{\pi}{4}-x\right)} = \left(\frac{1+\tan x}{1-\tan x}\right)^2$. [4]

OR

Prove that: $\sin x + \sin 3x + \sin 5x + \sin 7x = 4\cos x \cos 2x \sin 4x$.

Q.22 Reduce $\left(\frac{1}{1-4i} - \frac{2}{1+i}\right)\left(\frac{3-4i}{5+i}\right)$ to the standard form. [4]

OR

Find the modulus of the complex number $\frac{1+i}{1-i} - \frac{1-i}{1+i}$.

Q.23 Solve the equation: $3x^2 - 4x + \frac{20}{3} = 0$. [4]

OR

If α and β are the different complex numbers, where $|\beta| = 1$, then find the value of $\left|\frac{\beta-\alpha}{1-\bar{\alpha}\beta}\right|$.
