Karnataka Board

Question Paper

2024
Question Paper

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M – 2024

Register Number : [redacted]

Subject Code : 35

MATHEMATICS

Time : 3 Hours 15 Minutes] [Total No. of questions : 52] [Max. Marks : 80

Instructions : *1) The question paper has **five** Parts namely **A, B, C, D** and **E**. Answer **all** the Parts.*

*2) Part – **A** has **15** multiple choice questions, **5 fill** in the blank questions.*

PART – A

I. Answer **all** the multiple choice questions : **(15×1=15)**

1) The interval form of the $\{x : x \in R, -4 < x \leq 6\}$ set is

A) $[-4, 6]$ B) $(-4, 6]$ C) $(-4, 6)$ D) $[-4, 6)$

2) If the set 'A' has 3 elements and the set 'B' has 3 elements then the number of elements in $A \times B$ are

A) 9 B) 6 C) 3 D) 27

3) The radian measure of 240° is

A) $\frac{\pi}{3}$ B) $\frac{3\pi}{4}$ C) $\frac{\pi}{4}$ D) $\frac{4\pi}{3}$

4) The simplest form of the complex number i^{-35} is

A) i B) $-i$ C) 1 D) -1

5) The solution set of the inequality $30x < 200$. Where $x \in N$ is

A) {1, 2, 3, 4, 5, 6} B) {0, 1, 2, 3, 4, 5, 6}

C) {1, 2, 3, 4, 5, 6, 7} D) {..., –2, –1, 0, 1, 2, ...}

6) If ${}^nC_9 = {}^nC_8$, then ${}^nC_{17}$ is

A) 17 B) 7 C) 1 D) 10

7) In the expansion of $(a + b)^n$, the sum of the indices of 'a' and 'b' is

A) $n + 1$ B) $2n$ C) $n - 1$ D) n

8) The 4^{th} term of the sequence defined by $a_n = \frac{n}{n+1}$ is

A) $\frac{5}{4}$ B) $\frac{4}{5}$ C) $\frac{4}{3}$ D) $\frac{3}{4}$

9) Equation of a line parallel to x-axis and passing through the point (–2, 3) is

A) $x = 3$ B) $x = -2$ C) $y = 3$ D) $y = -2$

10) Equation of a circle with centre (0, 0) and radius 'r' units is

A) $(x-a)^2 + (y-b)^2 = r^2$ B) $x^2 + y^2 = 1$

C) $x^2 + y^2 = r^2$ D) $(x+a)^2 + (y+b)^2 = r^2$

11) The length of the Latus rectum of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is

A) $\frac{2b}{a^2}$ B) $\frac{2a}{b^2}$ C) $\frac{a}{2b^2}$ D) $\frac{2b^2}{a}$

12) The octant in which the point (–4, 2, –5) lie

A) II B) IV C) V D) VI

13) The value of $\lim_{x \to 0} \frac{\cos x}{\pi - x}$ is

A) π B) $\frac{1}{\pi}$ C) 0 D) limit does not exists

14) The mean value for the following data is :

4, 7, 8, 9, 10, 12, 13, 17

A) 10 B) 9 C) 8 D) 12

15) The probability of drawing a club card from a well shuffled deck of 52 cards is

A) $\frac{1}{13}$ B) $\frac{1}{52}$ C) $\frac{1}{4}$ D) $\frac{1}{2}$

II. Fill in the blanks by choosing appropriate answer from those given in the brackets : **(5×1=5)**

(42, –1, $\sqrt{3}$, 1, 0, 20)

16) If $\left(\frac{x}{3}+1, y-\frac{2}{3}\right) = \left(\frac{5}{3}, \frac{1}{3}\right)$ then the value of y is _____

17) The value of $\sin(n\pi)$ is _____, where $n \in z$.

18) The value of $\frac{7!}{5!}$ is _____

19) The slope of the line making inclination of 60° with the positive direction of x-axis is _____

20) The derivative of $x^2 - 2$ at $x = 10$ is _____

PART – B

III. Answer **any six** questions : **(6×2=12)**

21) Let V = {a, e, i, o, u} and B = {a, i, k, u}. Find V – B and B – V.

22) Let A = {a, b}, B = {a, b, c}. Is $A \subset B$? What is $A \cup B$?

23) Prove that $\sin^2\frac{\pi}{6} + \cos^2\frac{\pi}{3} - \tan^2\frac{\pi}{4} = -\frac{1}{2}$.

24) Find the multiplicative inverse of the Complex Number $Z = \sqrt{5} + 3i$.

25) Express $3(7 + i7) + i(7 + i7)$ in the form $a + ib$.

26) Solve $5x - 3 \geq 3x - 5$ and show the graph of the solution on number line.

27) How many 3-digit even numbers can be formed from the digits 1, 2, 3, 4, 6, 7 if no digit is repeated ?

28) Using Binomial Theorem, evaluate $(99)^3$.

29) Find the equation of the line intersecting the x-axis at a distance of 3 units to the left of origin with slope –2.

30) Evaluate $\lim_{x \to 0} \frac{\sqrt{1+x}-1}{x}$.

31) A die is thrown. Describe the following events :

i) A : a number less than 4.

ii) B : a number not less than 3.

PART – C

IV. Answer **any six** questions : **(6×3=18)**

32) If U = {1, 2, 3, 4, 5, 6, 7, 8, 9}

A = {2, 4, 6, 8} and B = {2, 3, 5, 7}.

Verify that $(A \cup B)' = A' \cap B'$.

33) Let $f(x) = x^2$ and $g(x) = 2x + 1$ be two real valued functions.
Find $(f + g)(x)$, $(f - g)(x)$ and $(fg)(x)$.

34) Prove that $\sin 3x = 3 \sin x - 4 \sin^3 x$.

35) If $x + iy = \frac{a+ib}{a-ib}$, prove that $x^2 + y^2 = 1$.

36) If $\tan x = \frac{-5}{12}$, x lies in II quadrant, find the values of other five trigonometric functions.

37) Find all pairs of consecutive odd natural numbers, both of which are larger than 10, such that their sum is less than 40.

38) If A.M. and G.M. of two positive numbers 'a' and 'b' are 10 and 8 respectively. Find the numbers.

39) Derive the equation of the line with x-intercept 'a' and y-intercept 'b' in the form

$\frac{x}{a} + \frac{y}{b} = 1$.

40) Find the equation of the parabola whose vertex is (0, 0), passing through the point (2, 3) and axis is along x-axis.

41) Show that the points P(–2, 3, 5), Q(1,2, 3) and R(7, 0, –1) are collinear.

42) Find the derivative of $y = \sin x$ with respect to x from first principle method.

PART – D

V. Answer **any four** questions : **(4×5=20)**

43) Define Modulus function. Draw the graph of it. Also write its domain and range.

44) Prove that $\frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} = \cot 3x$.

45) A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has :

i) no girl ?

ii) at least 3 girls ?

46) State and prove 'Binomial Theorem' for positive integral index 'n'.

47) Prove that the length of the perpendicular from a point (x_1, y_1) to a line $Ax + By + C = 0$ is $d = \frac{|Ax_1 + By_1 + C|}{\sqrt{A^2 + B^2}}$.

48) Prove geometrically that,

$\lim_{x \to 0} \frac{\sin x}{x} = 1$, where 'x' being measured in radians.

49) Find the mean deviation about mean for the following data :

x_i	5	10	15	20	25
f_i	7	4	6	3	5

50) A bag contains 9 discs of which 4 are red, 3 are blue and 2 are yellow. The discs are similar in shape and size. A disc is drawn at random from the bag. Calculate the probability that it will be :

i) red

ii) yellow

iii) blue

iv) not blue.

PART – E

VI. Answer the following questions :

51) Prove geometrically that

$\cos(x + y) = \cos x.\cos y - \sin x.\sin y.$

OR

Derive the equation of ellipse in the standard form $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1.$ **6**

52) Find the sum to 'n' terms of the sequence 8, 88, 888, ...

OR

Find the derivative of $\frac{\cos x}{1+\sin x}$ w.r.t. x. **4**

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