Karnataka Board

Mid-Term Question Paper

2024-25

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I PUC MID-TERM EXAMINATION, OCT./NOV.-2024

Time : 3 Hours **SUBJECT : MATHEMATICS (35)** **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 MCQ's. 5 Fill in the blanks of one mark each.**

PART-A

I Answer ALL the multiple choice questions : **15x1=15**

1) If $X = \{a, b, c, d\}$ and $Y = \{f, b, d, g\}$ then $X - Y =$
   A) $\{a, b\}$ B) $\{a, c\}$ C) $\{f, g\}$ D) $\{b, d\}$

2) The relation between the sets $A = \{2, 3\}$ and $B = \{x : x \text{ is a solution of } x^2 + 5x + 6 = 0\}$ is
   A) $A = B$ B) $A \neq B$ C) $A' = B'$ D) $A' \neq B'$

3) Let $A = \{2, 3\}$, $B = \{1, 5\}$ then the number of subsets of $(A \times B)$ is
   A) 4 B) 8 C) 16 D) 32

4) Statement 1 : A relation $f : A \to B$ is said to be a function if every element of set A need not have one and only one image in set B.
   Statement 2 : A function f is a relation from a non-empty set A to B such that the domain of f is A and no two distinct ordered pairs in f have the same first element.
   A) Statement 1 and 2 are true
   B) Statement 1 is true and 2 is false
   C) Statement 1 and 2 are false
   D) Statement 1 is false and 2 is true

5) The radian measure of 240° is
   A) $\frac{4\pi}{3}$ B) $\frac{3\pi}{4}$ C) $\frac{2\pi}{3}$ D) $\frac{7\pi}{3}$

6) If $\tan x = -\frac{5}{12}$, x lies in second quadrant then cosecx is
   A) $\frac{5}{13}$ B) $\frac{13}{5}$ C) $\frac{5}{12}$ D) $\frac{12}{5}$

7) The real part of $(5 - 3i)^3$ is
   A) 15 B) -10 C) 10 D) 27

8) The simplified form of $(-5i)\left(\frac{i}{8}\right)$ is
   A) $\frac{5}{8}$ B) 0 C) $\frac{8}{5}$ D) 1

9) **Match the following**

A	B
i) Slope-point form	a) $\frac{x}{a} + \frac{y}{b} = 1$
ii) Slope intercept form	b) $y = mx + c$
iii) Intercept form	c) $y - y_1 = m(x - x_1)$

A) (i)-(a) (ii)-(c) (iii)-(b) B) (i)-(b) (ii)-(a) (iii)-(c)
C) (i)-(b) (ii)-(c) (iii)-(a) D) (i)-(c) (ii)-(b) (iii)-(a)

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10) If $7x + 3 < 5x + 9$ then
A) $x > 3$ B) $x < 6$ C) $x < 3$ D) $x > 6$

11) The slope of the line passing through the points $(-2, 6)$ and $(4, 8)$ is
A) 3 B) $-1/3$ C) $1/3$ D) $3/4$

12) The equation of the line through $(-2, 3)$ with slope -4 is
A) $4x + y + 5 = 0$ B) $4x - y = 5$ C) $x - 4y - 5 = 0$ D) $x + 4y = 5$

13) The centre of the circle $x^2 + y^2 - 4x - 8y = 45$ is
A) $(2, 4)$ B) $(-2, 4)$ C) $(2, -4)$ D) $(-2, -4)$

14) The length of the latus rectum of the parabola $y^2 = -8x$ is
A) 8 B) -8 C) 4 d) -4

15) The eccentricity of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$
A) $4/\sqrt{7}$ B) $\sqrt{7}/4$ C) $-\sqrt{7}/4$ d) $\frac{-4}{\sqrt{7}}$

II Fill in the blanks by choosing the appropriate answer from those given in the bracket: **5x1=5**

$\left[6,\ 1/4,\ 0,\ 3/5,\ \sqrt{3},\ \phi\right]$

16) $A \cap A' =$ _____.

17) The value of $\tan\left(\frac{19\pi}{3}\right)$ is _____.

18) The radius of the circle $2x^2 + 2y^2 - x = 0$ is _____.

19) The length of major axis of the ellipse $4x^2 + 9y^2 = 36$ is _____.

20) The distance of the point $(3, -5)$ from the line $3x - 4y - 26 = 0$ is _____.

PART-B

III Answer any SIX questions : **6x2=12**

21) If $A = \{1, 2, 3, 4, 5, 6\}$, $B = \{2, 4, 6, 8\}$. Find $(A - B)$ and $(B - A)$.

22) If $t(C) = \frac{9C}{5} + 32$ then find $t(28)$.

23) The minute hand of a watch is 1.5 cm long. How far does its tip move in 40 minutes. (Use $\pi = 3.14$)

24) Prove that $3\sin\left(\pi/6\right)\sec\left(\pi/3\right) - 4\sin\left(\frac{5\pi}{6}\right)\cot\left(\frac{\pi}{4}\right) = 1$

25) Express $\frac{5 + i\sqrt{2}}{1 - i\sqrt{2}}$ in the form $(a + ib)$

26) If $\left(\frac{1+i}{1-i}\right)^m = 1$, then find the least positive integral value of m.

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27) Solve the inequality $\frac{3(x-2)}{5} \leq \frac{5(2-x)}{3}$ and show the graph of solution on number line.

28) Find all the pairs of consecutive odd positive integers both of which are smaller than 10 such that their sum is more than 11.

29) Find the equation of the line parallel to the line $3x-4y+2=0$ and passing through the point $(-2, 3)$

PART-C

IV Answer any SIX questions : **6x3=18**

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

31) If A = {1, 2, 3}, B = {3, 4} and C = {4, 5, 6} then find $(A \times B) \cap (A \times C)$.

32) Write the relation R={(x, x^3) : x is a prime number less than 10} in Roaster form write its Domain and Range.

33) Let f(x) = x + 1 and g(x) = 2x−3 be two functions over the set of non-negative real numbers. Find (f + g) (x), (f−g) (x) and $\left(\frac{f}{g}\right)(x)$.

34) Prove that $\frac{\tan\left(\frac{\pi}{4}+x\right)}{\tan\left(\frac{\pi}{4}-x\right)} = \frac{(1+\tan x)^2}{(1-\tan x)^2}$.

35) Prove that $\cos(3x) = 4\cos^3 x - 3\cos x$

36) Ravi obtained 70 and 75 marks in first two test. Find the minimum marks he should get in the third test to have an average of atleast 60 marks.

37) Derive the formula to find the equation of the line formed by the points (x_1, y_1) and (x_2, y_2).

38) Find the equation of the circle which passes through the points (2, −2) and (3, 4) and whose centre lies on the line x + y = 2.

PART-D

V Answer any FOUR questions : **4x5=20**

39) Define greatest integer function. Draw the graph of the function. Write the domain and range of the function.

40) Define modulus function. Draw the graph of the function. Write the domain and the range of the function.

41) Prove that $(\cos x + \cos y)^2 + (\sin x - \sin y)^2 = 4\cos^2\left(\frac{x+y}{2}\right)$.

42) Derive the equation of a line with x-intercept and y-intercept a and b respectively. Also find the equation of the line, which makes intercepts −3, and 2 on the x and y-axes respectively.

43) Define parabola and find the equation of parabola in its standard form $y^2 = 4ax$. Also find the equation of the parabola with directrix x =−2 and focus (2, 0).

44) Find the coordinates of foci, the length of major and minor axes and the eccentricity of the ellipse $9x^2 + 4y^2 = 36$.

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45) Derive the formula to find the length of the perpendicular from the point (x_1, y_1) to a line $Ax + By + C = 0$ in the from $d = \frac{|Ax_1 + By_1 + C|}{\sqrt{A^2 + B^2}}$

PART-E

VI Answer the following questions :

46) Prove geometrically that $\cos(x + y) = \cos x \cos y - \sin x \sin y$ and hence show that $\cos 2x = \cos^2 x - \sin^2 x$.

OR

Define Hyperbola and derive the equation of the hyperbola in the form $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$. **(6)**

47) Prove that $\tan 3x \cdot \tan 2x \cdot \tan x = \tan 3x - \tan 2x - \tan x$.

OR

The line through the points (h, 3) and (4, 1) intersects the line $7x - 9y - 19 = 0$ at right angle. Find the value of h. **(4)**

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