

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

SUBJECT : BASIC MATHEMATICS (75)

Time : 3 Hours

Max Marks : 80

Instructions :

- The question paper has 4 parts A, B, C, D. Answer all the parts.
- PART-A carries 20 marks, PART-B carries 12 marks, PART-C carries 18 marks, PART-D carries 30 marks.
- Write the question number properly as indicated in the question paper.

PART-A

I. Choose the correct answer (Each question carries 1 mark) : 10x1=10

- The imaginary part of $4 + 3i$ is
a) 4 b) -3 c) -4 d) 3
- The value of $\left[\left\{\sqrt[3]{x^2}\right\}^3\right]^{\frac{1}{2}}$ is
a) $x^{\frac{1}{2}}$ b) x c) x^2 d) x^3
- Exponential form of $\log_2 \frac{1}{4} = -2$ is
a) $2^{\frac{1}{2}} = -2$ b) $(-2)^{\frac{1}{4}} = 2$ c) $2^{-2} = \frac{1}{4}$ d) $\left(\frac{1}{4}\right)^2 = -2$
- The sum to infinite terms of the G.P. $1, \frac{1}{2}, \frac{1}{4}, \dots$ is
a) 2 b) 1 c) $\frac{1}{2}$ d) $\frac{1}{4}$
- If the interest rate is 12%, the doubling periods as per rule of 72 is
a) 6 years b) 12 years c) 5 years d) 10 years
- The average age of 10 students is 6 years. The sum of the ages of 9 of them is 52 years, then the age of 10th student is
a) 6 years b) 10 years c) 8 years d) 12 years
- The degree form of $\frac{7\pi}{10}$ is
a) 126° b) 70° c) 22° d) 14°
- The value of $\cos 120^\circ$ is
a) $\frac{1}{2}$ b) $\frac{\sqrt{3}}{2}$ c) $-\frac{1}{2}$ d) $-\frac{\sqrt{3}}{2}$
- The point $(-3, 2)$ lies in
a) 1st Quadrant b) 2nd Quadrant c) 3rd Quadrant d) 4th Quadrant
- The equation of the locus of a point which moves such that the sum of its distance from co-ordinates axes is 5 is
a) $x - y = 5$ b) $x = y = 5$ c) $x = y - 5$ d) $x + y = 5$

(P.T.O.)

II Match the following :

5x1=5

- | | |
|--|--------|
| 11) i) The value of $(5)^{5^0} + (5^2)^0$ is | a) -89 |
| ii) The value of 'x' in $\log_{\sqrt{x}} 4 = 2$ is | b) 2 |
| iii) 30 th term of AP. -2, -5, -8, is | c) 6 |
| iv) S.I. on ₹ 600 for 3 years 3 months at 4% is | d) 89 |
| v) The value of $(\cos A + \sin A)^2 + (\cos A - \sin A)^2$ is | e) 4 |
| | f) 78 |

III - Fill in the blanks by choosing appropriate answer from the given options : 5x1=5

$$\left[130, \tan A, 124, \cot A, 0, \frac{6}{11} \right]$$

- 12) The number which when divided by 16, 20 and 40 leaves the same remainder is _____.
- 13) The value of $2 \log \frac{3}{7} + \log \frac{49}{9}$ is _____.
- 14) If $\frac{1}{3}, x, \frac{3}{2}$ are in HP, then x is _____.
- 15) The average ages of 10 boys in a class is 13 years. Sum of their ages is _____.
- 16) The value of $\sin A \cdot \sec A$ is _____.

PART-B

IV Answer any SIX of the following questions :

6x2=12

- 17) Find the HCF of 55 and 210.
- 18) Simplify $\left(\frac{x^a}{x^b}\right)^{a+b} \cdot \left(\frac{x^b}{x^c}\right)^{b+c} \cdot \left(\frac{x^c}{x^a}\right)^{c+a}$.
- 19) Find the number of digits in the integral part $(3.546)^{20}$.
- 20) Find 9th element of a H.P. $\frac{1}{7}, \frac{1}{8}, \frac{1}{9}, \frac{1}{10}, \dots$
- 21) Find the effective rate of interest when a sum lent at 9% is computed quarterly.
- 22) The average score of 35 girls is 80 and the average score of 25 boys is 68. Find the average score of both boys and girls together.
- 23) The angles of a triangle are in the ratio 3 : 4 : 5. Find them in radians.
- 24) Prove that $\cos (189^\circ) + \cos 9^\circ = 0$.
- 25) Find the area of the triangle whose vertices are A(3, 4), B(2, -1), and C(4, -6).
- 26) Find the equation of the locus of the point equidistant from (-1, -1) and (4, 2).

PART-C

V Answer any SIX of the following questions :

6x3=18

- 27) Prove that $\sqrt{2}$ is an irrational number.
- 28) If $p^x = q^y = r^z = s^w$ and $pq = rs$ then prove that $\frac{1}{x} + \frac{1}{y} = \frac{1}{z} + \frac{1}{w}$.
- 29) Prove that $\log x + \log x^2 + \log x^3 + \dots + \log x^n = \frac{1}{2} n(n+1) \log x$.

(P.T.O.)

- 30) A person buys every year Bank's Cash Certificate of value exceeding the last year's purchase by ₹ 500. After 15 years, he finds that the total value of the certificates purchased by him is ₹ 82,500. Find the value of the certificates purchased by him a) in the first year and b) in the 10th year.
- 31) Calculate the Compound interest on ₹ 600 for $4\frac{1}{2}$ years at 7% p.a.
- 32) A school runs in morning and afternoon shift and employs 40 teachers. The average salary of 25 teachers working in the morning shift is ₹ 2800/- and the average salary of teachers working the afternoon shift is ₹ 3000/- find the average salary of the teachers in the school.
- 33) Prove that $\frac{1 + \sin A}{1 - \sin A} - \frac{1 - \sin A}{1 + \sin A} = 4 \sec A \cdot \tan A$.
- 34) Find the value of $\frac{\sin \frac{\pi}{2} \cdot \cos^2 \frac{\pi}{6} \cdot \sec^2 \frac{\pi}{4}}{\tan \frac{\pi}{3} + \cot \frac{\pi}{3}}$.
- 35) Find the ratio in which the point (-5, 2) divides the join of (-7, 1) and (3, 6) internally?
- 36) Find the locus of a point which moves so that its distances from the point A (3, 1) and B (1, 3) are in the ratio 2 : 3.

PART-D

VI Answer any SIX of the following questions :

6x5=30

- 37) Find the number of positive divisors and the sum of all positive divisors of 960.
- 38) If $a^{\frac{1}{3}} + b^{\frac{1}{3}} + c^{\frac{1}{3}} = 0$, then show that $(a + b + c)^3 = 27 abc$.
- 39) If $\log_a (bc) = x$, $\log_b (ca) = y$, $\log_c (ab) = z$, show that $\frac{1}{x+1} + \frac{1}{y+1} + \frac{1}{z+1} = 1$.
- 40) Using logarithmic tables find the value of $\frac{12.567 \times 15.674}{0.5968 \times 19.78}$.
- 41) Find the sum to 'n' terms of the series $5 + 55 + 555 + \dots$
- 42) If the difference between simple interest and compound interest for 3 years at 2.5% p.a. is ₹ 625, find the sum invested.
- 43) An aeroplane flies once round a square whose side is 100 km long taking the first at 100 kmph., second at 200 kmph, third at 300 kmph and the fourth at 400 kmph. Find the average speed of the plane in its flight along the square.
- 44) If $x = a \sin \alpha \cos \beta$, $y = b \sin \alpha \sin \beta$, $z = c \cos \alpha$ show that $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$.
- 45) If $\sin \theta = -\frac{8}{17}$ and $\pi < \theta < \frac{3\pi}{2}$. Find the value of $\frac{\tan \theta - \cos \theta}{\sec \theta + \cos \theta}$.
- 46) Show that the points (2, -1), (3, 4), (-2, 3) and (-3, -2) form a rhombus.
