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MATHEMATICS — Paper ITime Allowed : $2\frac{1}{2}$ Hours]

[Maximum Marks : 100

Instruction : Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

- N. B.* :
- i) The paper consists of five Sections A, B, C, D and E.
 - ii) Read the instructions under each Section carefully, before you start answering.
 - iii) Diagrams may be drawn wherever necessary.
 - iv) Rough work should be done at the bottom of the pages of the answer-book.

SECTION - A

Note : Answer all the ten questions.

 $10 \times 1 = 10$

1. If $A = \{10, 9, 8\}$ and $B = \{8, 7, 6, 5\}$, then $A - B$ is
 - 1) $\{7, 6, 5\}$
 - 2) $\{10, 9, 8\}$
 - 3) $\{10, 9\}$
2. If $f(x) = 4^x$, then $f\left(\frac{1}{2}\right) =$
 - 1) $\frac{1}{2}$
 - 2) 2
 - 3) 16.

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3. If $\log 2 = 0.3010$ and $\log 3 = 0.4771$, then $\log 6$ is

1) 0.7781

2) 1.7871

3) 0.7187

4. The fifth term of the G.P. 3, 6, 12, is

1) 12

2) 48

3) 24.

5. The slant height of a cone whose height is 24 cm and radius 7 cm is

1) 26 cm

2) 24 cm

3) 25 cm.

6. The total surface area of a hemisphere is

1) $2\pi r^2$

2) $3\pi r^2$

3) $4\pi r^2$.

7. The product of the roots of the equation $ax^2 + bx + c = 0$ is

1) $\frac{b}{a}$

2) $-\frac{b}{a}$

3) $\frac{c}{a}$

8. The square root of $64a^{16} b^8$ is

1) $8a^4 b^2$

2) $8a^4 b^4$

3) $8a^8 b^4$

9. The sum of the roots of the equation $5x^2 + 20x + 20 = 0$ is

1) -4

2) 4

3) -5

10. The value of $\frac{x^2 - 4y^2}{x^2 - 2xy}$ is

1) $\frac{y+2x}{x}$

2) $\frac{x-2y}{x}$

3) $\frac{x+2y}{x}$

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SECTION - B

Note : Answer any ten questions.

10 × 3 = 30

11. Given $\xi = \{ 1, 2, 3, \dots, 10 \}$, $A = \{ 2, 3, 5, 6, 8 \}$, $B = \{ 2, 4, 6, 7, 9 \}$.
Find $A' \cup B'$.
12. In a group of 36 students, 26 can speak in English, 19 can speak in Hindi. Find how many can speak both.
13. Given $f(x) = 5x + 3$, $g(x) = 2x - 1$. If $f \circ g(x) = 28$, find x .
14. Given $f(x) = x^2 - 1$, $x = \{-2, -1, 1, 2\}$, find the range of the function.
15. Find the number of significant digits in 35^{20} .
16. Evaluate using logarithm $(0.089)^{\frac{4}{7}}$.
17. Find the 10th term of the G.P. $1, \frac{2}{3}, \frac{4}{9}, \frac{8}{27}, \dots$
18. Find the sum to infinity in the G.P. $1, \frac{2}{3}, \frac{4}{9}, \dots$
19. If Kannan's net taxable income is Rs. 1,00,000, find his income tax.
20. Find the T. S. A. of a hemisphere whose diameter is 28 cm.
21. Find the L. S. A. of cone given height 12 cm and diameter of the base 18 cm.
22. Sum of the squares of two consecutive numbers is 145. Find the numbers.
23. Find the G. C. D. of $x^2 + xy$, $xy + y^2$.
24. Simplify :
$$\frac{4}{1+a} - \frac{3}{1-a} + \frac{7a}{1-a^2}$$
25. Find the square root of the following :
$$\left(a - \frac{1}{a}\right)^2 - 12\left(a - \frac{1}{a}\right) + 36.$$

SECTION - C

Note : Answer all the questions, choosing either (a) or (b) in each question.

$$6 \times 5 = 30$$

26. a) Show by Venn diagram $A - (B \cap C) = (A - B) \cup (A - C)$.

OR

- b) In a group of 100 girls, 50 wear earrings, 40 wear bangles, 70 wear necklaces, 24 wear earrings and bangles, 21 wear bangles and necklaces, 34 wear necklaces and earrings. If 5 do not wear any of them, find how many wear all the three.

27. a) Given $f(x) = 5x + 1$, $g(x) = x + 3$, $h(x) = x$, $x = \{0, 1, 3, 5\}$. Find the range of $h \circ (g \circ f)(x)$.

OR

- b) Given $f(x) = \frac{x+3}{2}$, $g(x) = \frac{2x+1}{3}$, $h(x) = \frac{x+1}{4}$, verify the associative property of composition of functions.

28. a) Evaluate using logarithms : $\frac{487 \cdot 6 \times 0 \cdot 0514}{37 \cdot 49}$.

OR

- b) Evaluate using logarithm : $(5 \cdot 398)^2 + (0 \cdot 974)^3$.

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29. a) Raman's monthly salary is Rs. 8,400 excluding HRA. He saves Rs. 400 p.m. in the P.F. He pays Rs. 2,000 towards LIC premium and invests Rs. 5,000 in National Savings Certificate. Calculate the income tax to be paid.

OR

- b) Mr. Madan gets an annual income of Rs. 1,30,000 (not including HRA). He pays Rs. 500 p.m. towards the income tax from the salary. His contribution towards P.F., LIC, and CTD comes to Rs. 45,000. What is the balance of income tax he has to pay, if any ?
30. a) A cylindrical jar of radius 21 cm contains water. If 9 conical solids of radius 3.5 cm and height 4 cm are immersed into it, find the rise in the level of water.

OR

- b) Find how many litres of water will flow through a cylindrical pipe of radius 3.5 cm in 40 minutes if the water flows at the rate of 12 km/hr.
31. a) In a G.P. $t_4 = \frac{1}{4}$, $t_8 = \frac{1}{64}$. Find the G.P.

OR

- b) If $S_n = 1 + 5 + 5^2 + \dots$ 'n' terms, find the least value of 'n' such that $S_n > 1500$.

SECTION - D

Note : Answer all the questions, choosing either (a) or (b) in each question.

4 × 5 = 20

32. a) Simplify the following :

$$\frac{(x+2)}{x^2+5x+6} + \frac{(x+3)}{x^2+2x-3} - \frac{(x-4)}{x^2-2x-8}$$

OR

b) Simplify the following :

$$\frac{a^2-5a+6}{a^2+5a+4} \div \frac{a^2-4a+3}{2a^2+3a+1} \times \frac{a^2+3a-4}{2a^2-3a-2}$$

33. a) If one root of the equation $2x^2 - x - k = 0$ is twice the other, find k .

OR

b) If α and β are the roots of the equation $x^2 - 3x - 2 = 0$, form the equation whose roots are $\alpha + 3$ and $\beta + 3$.

34. a) Resolve into partial fractions :

$$\frac{5x-1}{(x+2)(x+3)}$$

OR

b) Resolve into partial fractions :

$$\frac{m^2}{(m-1)^3}$$

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35. a) Find the L.C.M. of $9x^2 - 4$, $3x^2 + 10x - 8$.

OR

b) The G. C. D. of two polynomials is $(x + 3)$. The product of the two polynomials is $(x^2 + x - 6) \times (x^2 - 2x - 15)$. Find the L. C. M.

SECTION - E

Note : Answer the question, choosing one of the alternatives (a) or (b).

$1 \times 10 = 10$

36. a) Solve graphically : $x^2 - 3x - 10 = 0$

OR

b) Draw the graph of $y = x^2 - 4x + 3$ and hence solve $x^2 - 5x - 6 = 0$.
