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**MATHEMATICS — Paper I**

Time Allowed :  $2\frac{1}{2}$  Hours ]

[ Maximum Marks : 100

- 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  $A = \{ 1, 2, 3, 4 \}$ ,  $B = \{ 2, 3, 5 \}$ , then  $n(A \cap B)$  is
  - 1) 2
  - 2) 3
  - 3) 4.
2. If  $\{ (a, 3), (7, b) \}$  represents an identity function, then the values of  $a$  and  $b$  are respectively
  - 1) 3, 7
  - 2) 7, 7
  - 3) 3, 3.

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3. The characteristic of  $\log 24.37$  is
- 1) 0
  - 2) 1
  - 3) 2.
4. The L.C.M of  $6x^2yz$ ,  $8xy^2z^3$ ,  $12x^3y^3z^2$  is
- 1)  $6xyz$
  - 2)  $12x^2y^2z^2$
  - 3)  $24x^3y^3z^3$ .
5. Volume of sphere with radius  $r$  is
- 1)  $\frac{4}{3} \pi r^3$
  - 2)  $\frac{2}{3} \pi r^3$
  - 3)  $4 \pi r^2$ .
6. The curved surface area of a sphere, whose diameter is 14 cm is
- 1) 88 sq.cm
  - 2) 616 sq.cm
  - 3) 308 sq.cm.
7. The nature of the equation  $x^2 - 7x + 16 = 0$  is
- 1) real
  - 2) imaginary
  - 3) irrational.

8. The square root of  $x^2 + 2x + 1$  is

1)  $(x + 1)$

2)  $(x - 1)$

3)  $(x + 1)^2$ .

9. The value of  $\frac{x^2 - y^2}{x - y}$  is

1)  $x + y$

2)  $x - y$

3)  $x^2 - y^2$ .

10. The next term of the G.P. 16, 24, 36, 54, ..... is

1) 27

2) 81

3) 18.

### SECTION - B

Note : Answer any ten questions.

$10 \times 3 = 30$

11. Given  $A = \{2, 3, 5, 6, 8\}$ ,  $B = \{2, 5, 6, 7, 9\}$  and  $C = \{2, 4, 6, 7, 8\}$ ; find  $A \cap (B \cup C)$ .

12. Given  $U = \{2, 4, 6, 8, 10, 12\}$ ,  $A = \{2, 6, 10\}$  and  $B = \{2, 4, 8, 12\}$ ; find  $(A - B)'$ .

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13. If  $f(x, y) = x^2 + xy - 2y^2$ , find the value of  $f(1, 2)$ .

14. If  $f(x) = \frac{1}{x}$ , find  $f \circ f$ .

15. Evaluate using logarithms :  $\frac{21 \cdot 25}{0.027}$ .

16. Find the number of significant digits in  $2^{15}$ .

17. Find the sum up to 8 terms of the G.P.  $1, \frac{1}{2}, \frac{1}{4}, \dots$

18. Find the G.P. if  $t_3 = 16, t_7 = 1$ .

19. Mr. Mohan's net taxable income is Rs. 76,000/-. What is his income tax ?

20. A metal ball is a hollow sphere of external and internal radii 4 cm and 3 cm respectively. Find the volume of metal used.

21. The volume of a sphere is 38,808 cu.cm. Find its diameter.

22. Sum of a number and its square is 72. Find the number.

23. Find the G.C.D. of  $x^2 + xy$  and  $x^2 - xy$ .

24. Reduce  $\frac{4x^2 - 20x}{x^2 - 4x - 5}$  to its lowest term.

25. Find the square root of  $4a^2 - 12ab + 9b^2$ .

## SECTION - C

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

6 × 5 = 30

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

OR

- b) In a class of 80 boys, 30 passed in English, 30 passed in Mathematics, 33 passed in Tamil, 7 passed in English and Mathematics, 9 passed in Mathematics and Tamil, 8 passed in English and Tamil and 3 passed in all the three subjects. How many failed in all the three subjects?

27. a) Given  $f(x) = 1 - 3x$ ,  $g(x) = 2 - 5x$  and  $h(x) = 3x + 2$ . Prove that  $f \circ (g \circ h) = (f \circ g) \circ h$ .

OR

- b) Given  $f(x) = 2x + 5$ ,  $g(x) = 3 - 4x$ ,  $x = \{-2, -1, 0, 1, 2\}$ ; find the range of  $g \circ f(x)$ .

28. a) Find the fifth root of  $(36.64)^2 \times (4.782)^2$  using logarithm tables.

OR

- b) Evaluate using logarithm :  $\sqrt{\frac{130 \times 25.2}{0.78}}$ .

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29. a) Murugan's annual pay excluding HRA is Rs. 98,000. He contributes Rs. 800 p.m. towards P.F. and Rs. 4,200 as L.I.C. premium. Calculate the income tax to be paid.

OR

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- b) Mr. Kannan gets a total income of Rs. 1,20,000 per year ( without HRA ). He deposits Rs. 600 p.m. in P.F., Rs. 5,800 in L.I.C. premium, purchases NSC worth Rs. 5,000. Find his net taxable income and the income tax to be paid by him.

30. a) A solid metallic cone of radius 35 cm and height 0.9 m is melted and converted into a wire of radius 3.5 cm. Find the length of the wire so obtained.

OR

- b) A vessel is in the shape of a hemisphere surmounted by a cylinder. The maximum height is 41 cm and the common diameter is 42 cm. Find the capacity of the vessel.

31. a) Find the sum up to  $n$  terms of the series  $0.1 + 0.11 + 0.111 + \dots$ .

OR

- b) In a G.P.,  $t_6 = 64$ ,  $t_{10} = 1024$ . Find  $t_4$ .

## SECTION - D

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

$$4 \times 5 = 20$$

- a) Simplify the following :

$$\frac{a^4 - 8a}{2a^2 + 5a - 3} \times \frac{2a - 1}{a^2 + 2a + 4} \div \frac{a^2 - 2a}{a + 3}$$

OR

- b) Simplify the following :

$$\frac{x - y}{xy} + \frac{y - z}{yz} + \frac{z - x}{zx}$$

3. a) If one root of the equation  $2x^2 - qx + 64 = 0$  is twice the other, find the value of  $q$ .

OR

- b) If  $\alpha$  and  $\beta$  are the roots of the equation  $x^2 - 5x + 6 = 0$ , find the equation whose roots are  $\alpha + 2$  and  $\beta + 2$ .

34. a) Resolve  $\frac{7x + 18}{x^2 + 5x + 6}$  into partial fractions.

OR

- b) Resolve  $\frac{6x}{(x^2 - 4)(x - 1)}$  into partial fractions.

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35. a) Find the L.C.M. of  $x^2 + 4x + 3$ ,  $x^2 + 6x + 9$  and  $2x^2 + 5x + 3$ .

OR

- b)  $\text{GCD} = (x + 3)$ ,  $\text{LCM} = (x + 3)(x - 8)(x + 2)$ . If one of the polynomials is  $x^2 + 6x + 9$ , find the other polynomial.

**SECTION - E**

Note : Answer the question, choosing one of the alternatives (a) or (b). 10

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

OR

- b) Draw the graph of  $y = x^2 - 2x - 8$  and hence solve  $x^2 - 3x - 10 = 0$ .
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