Register Number

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 : i) Answer all the *ten* questions.

ii) Each question carries *one* mark. $10 \times 1 = 10$

1. If $A = \{ 1, 2, 3 \}$, $n[P (A)]$ is

   a) 3

   b) 8

   c) 6.

2. If $f (x) = \frac{1}{x}$, $g (x) = \frac{1}{x^2}$ $g \, of$ is

   a) x^2

   b) $\frac{1}{x^3}$

   c) $\frac{1}{x}$.

[Turn over

3. The characteristic of the logarithm of 13·24 is

    a)   1·2

    b)   14

    c)   1.

4. The next term in the series $1, \frac{1}{2}, \frac{1}{4}, \ldots\ldots$ is

    a) $\frac{1}{6}$

    b) $\frac{1}{8}$

    c) $\frac{1}{16}$.

5. The T.S.A. of a hemisphere is

    a) $2\pi r^2$

    b) $3\pi r^2$

    c) $4\pi r^2$.

6. Area of cross-section of a cylindrical pipe of radius 7 cm is

    a) 49 cm^2

    b) 14 cm^2

    c) 154 cm^2.

7. GCD of $a^2 - b^2$ and $a^2 - 2ab + b^2$ is

    a) $a - b$

    b) $a + b$

    c) $-2ab$.

8.   The value of $\dfrac{x^2 + xy}{xy + y^2}$ is

   a) $x + y$

   b) $\dfrac{x}{y}$

   c) $\dfrac{y}{x}$.

9.   The roots of the quadratic equation $(x + 4)(x - 3) = 0$ are

   a)   4, 3

   b)   – 4, 3

   c)   4, – 3.

10. In a quadratic equation $ax^2 + bx + c = 0$, the roots are imaginary if

   a) $b^2 - 4ac > 0$

   b) $b^2 - 4ac = 0$

   c) $b^2 - 4ac < 0$.

SECTION – B

   Note :   i)   Answer any *ten* questions.

   ii)   Each question carries *three* marks.   10 × 3 = 30

11. If $A = \{2, 3, 5, 6, 8\}$, $B = \{2, 4, 6, 7, 9\}$ and $C = \{2, 3, 4, 6, 9, 10\}$,
   find $(B - A) \cup (A - C)$.

12. Prove by Venn diagram $A - B \neq B - A$.

13. If $f(x) = \dfrac{1}{x}$, find $f \circ f(x)$.

14. If $f(x, y) = x^2 + xy - 2y^2$, find the value of $f(0, 2)$.

[Turn over

15. Evaluate : $3\sqrt{50\cdot49}$

16. Find the number of zeroes between the decimal point and the first significant digit in $(0\cdot3)^{34}$.

17. Find the 6th term of the G.P. 125, 25, 5, ...

18. Find the sum upto 10 terms of the G.P. 12, -8, $\dfrac{16}{3}$, ...

19. Mention 3 contributions eligible for deductions U/S. 88.

20. Find the volume of a sphere with radius 7 cm.

21. T.S.A. of a hemisphere is $588\,\pi$ cm^2. Find its diameter.

22. If $3 + \sqrt{7}$, $3 - \sqrt{7}$ are the roots of a quadratic equation, find the equation.

23. Find the GCD of $xy - y$ and $x^3 y - xy$.

24. Simplify : $\dfrac{x^2 + 8x + 12}{x^2 + 13x + 42}$.

25. Find the square root of $\left(a - \dfrac{1}{a} \right)^2 - 12 \left(a - \dfrac{1}{a} \right) + 36$.

SECTION – C

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

        ii)   Each question carries *five* marks. $6 \times 5 = 30$

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

OR

b)   In a group of 50 boys, 27 like to play football, 16 play hockey and 18 play basketball, 8 play both football and hockey, 3 play hockey and basketball and 7 play basketball and football. If 3 play all the games, find

    i)   how many play only one game.

    ii)   how many play only any two games.

    iii)   how many do not like games at all.

27. a)   If $f(x) = 4x + 1$, $g(x) = 5x - 3$, verify the commutative property of composition of functions.

OR

b)   Given $f(x) = x + 2$, $g(x) = 2x + 3$, $h(x) = 3x - 4$.

Check whether composition of function is associative.

28. a)   Evaluate using logarithms : $\sqrt{\dfrac{0.876 \times 7.04}{0.0431}}$.

OR

b)   Find V in the formula $V = \dfrac{1}{3} \pi r^2 h$, if $\pi = 3.14$, $r = 3.5$ cm, $h = 27$ cm using log tables.

[Turn over

29. a) A man pays Rs. 500 p.m. towards P.F. and Rs. 2,400 towards LIC annual premium. If his annual income excluding HRA is Rs. 75,400, what is his income tax due ?

OR

b) Mr. Jacob has an annual income of Rs. 89,000 exclusive of HRA. He pays Rs. 450 p.m. towards PF, Rs. 1,500 to LIC annual premium and buys NSC worth of Rs. 1,500. Find the income tax due from him.

30. a) 8 metallic spheres each of radius 2 cm are melted and cast into a single sphere. Calculate the radius of the new sphere.

OR

b) A rectangular swimming pool is of dimensions 30 m × 10 m × 4 m. Water is filled in the tank through cylindrical pipe of diameter 20 cm and it flows at the rate of 15 km/hr. Find the time taken to fill the tank.

31. a) In a G.P., $t_3 = 16$, $t_7 = 1$, find the G.P.

OR

b) Find the least number of terms of the series $1 + 3 + 3^2 + \ldots\ldots$ for which $S > 2500$.

SECTION – D

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

ii) Each questions carries *five* marks. $4 \times 5 = 20$

32. a) Simplify the following :

$$\frac{x}{x-y} - \frac{y}{x+y} - \frac{2xy}{x^2 - y^2}$$

OR

b) Simplify the following :

$$\frac{x^2 - 1}{x^2 + 5x - 6} \times \frac{x^3 - 216}{x^2 + 6x + 36} \div \frac{x^2 + x}{x^2 + x + 1}.$$

33. a) The roots of the equation $x^2 + 20x + k = 0$ are in the ratio of $2 : 3$. Find k.

OR

b) If the roots of the quadratic equation $4x^2 + (m - 1)x + (m + 4) = 0$ are equal, find the value of m.

34. a) Resolve into partial fractions : $\dfrac{2x - 3}{(x + 2)(x + 3)}.$

OR

b) Resolve $\dfrac{3x^2 + 2x + 15}{(x + 6)(x^2 + 1)}$ into partial fractions.

[Turn over

35. a) Find the LCM of $x^2 - 10x + 24$, $x^2 - 11x + 30$.

OR

b) LCM of two polynomials is $(a + 2)(a^2 - 10a + 25)$. There GCD is $(a - 5)$. One of the polynomials is $(a^2 - 3a - 10)$. Find the other polynomial.

SECTION – E

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

      ii) The question carries *ten* marks. $1 \times 10 = 10$

36. a) Draw the graph of $y = x^2 - 9x + 20 = 0$ and hence solve $x^2 - 9x + 20 = 0$.

OR

b) Solve graphically : $y = (x - 6)(x - 3)$.