7458

Register Number | | | | | | |

MATHEMATICS — Paper I

Time Allowed : $2\frac{1}{2}$ Hours] [Maximum Marks : 100

N. B. : i) Read the instructions under each Section carefully, before you start answering.

ii) Diagrams may be drawn wherever necessary.

iii) 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. $(A \cup B)'$ is equal to

   1) $A' \cup B'$

   2) $A' \cap B'$

   3) $A \cap B$.

2. If $f(x) = x^2 + 1$, then the value of $f(-1)$ is

   1) 0

   2) -1

   3) 2.

3. The characteristic of the logarithm of 2·816 is

1) 1

2) 0

3) 3.

4. In a G.P., $t_1 = \frac{10}{3}$, $t_2 = \frac{20}{9}$, then the common ratio is

1) $\frac{3}{2}$

2) $\frac{2}{3}$

3) $\frac{1}{3}$.

5. The volume of a hemisphere of radius 1 unit is

1) $\frac{2}{3}\pi$ cu.units

2) $\frac{3}{2}\pi$ cu.units

3) $\frac{4}{1}\pi$ cu.units.

6. The ratio of the radii of two spheres is 1 : 2. Then the ratio of their volumes is

1) 4 : 1

2) 1 : 8

3) 8 : 1.

7. The G.C.D. of $ab + b^2$, $ab + a^2$ is

1) ab

2) $a^2 + b^2$

3) $a + b$.

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

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

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

3) $\frac{x - y}{x + y}$.

9. In a quadratic equation $ax^2 + bx + c = 0$, the roots are real and equal if

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

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

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

10. The square root of $\frac{16}{m^{18}\ n^8}$ is

   1) $\pm \frac{4}{m^9\ n^8}$

   2) $\pm \frac{4}{m^9\ n^4}$

   3) $\pm \frac{4}{m^{36}\ n^{16}}$.

SECTION – B

Note : Answer any *ten* questions. $10 \times 3 = 30$

11. If A = { All natural numbers less than 10 }

   B = { $x \mid 1 \leq x \leq 6$, x *is* an even integer }

   C = { $x \mid 2 \leq x < 6$, x is an integer },

   find A $\cup$ (B $\cap$ C).

12. In a group of girls, 45 know to sing, 32 know to dance. If 17 know both, find the number of girls in the group.

13. If $f(x) = 2x^2 - x + 3$, find the value of $f(2) + f(1)$.

14. Given $f(x) = 29x + a$, $g(x) = x + 3$; if $(gof)(-4) = 1$, find the value of a.

15. Find the number of zeros between the decimal point and the first significant digit in $(0{\cdot}07)^{40}$.

16. If log 3 = 0·4771 and log 7 = 0·8451, then find the value of log $\left(\sqrt{21}\right)$.

17. Find the 12th term of a G.P. 81, 27, 9, ...

18. Find the sum up to infinity of the G.P. 54, 18, 6, 2, ...

19. Mr. Sanjay's net taxable income is Rs. 96,000. What is his income tax ?

20. Find the volume of a sphere whose radius is 35 cm.

21. Find the diameter of a hemisphere whose T.S.A. is $150\frac{6}{7}$ sq. cm.

22. The sum of a number and its square is 30. Find the number.

23. Find the L.C.M of $(x + y)^2 - z^2$, $(y + z)^2 - x^2$.

24. Simplify : $\dfrac{x^2 - 5x + 6}{x^2 - 6x + 9}$

25. Find the square root of $(x^2 + 3x)(x^2 + 3x - 4) + 4$.

SECTION – C

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

$6 \times 5 = 30$

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

OR

b) Out of 112 students who participated in a competition, 70 took part in drawing, 60 in painting, 50 in sketching. 22 took part in drawing and painting, 30 in painting and sketching, 26 in sketching and drawing. Find how many participated in all the three competitions.

27. a) Given $f(x) = \frac{x+2}{2}$, $g(x) = \frac{2x-1}{4}$; verify the commutative property of composition of function.

OR

b) Given $f(x) = 2x + 1$, $g(x) = 2 - 5x$, $h(x) = 4x + 3$. Find the range of $fo(goh)(x)$ if $x = \{-1, 0, 1, 2, 3\}$.

28. a) Evaluate using logarithm : $\frac{0 \cdot 9432 \times 73 \cdot 56}{0 \cdot 08143 \times 4691}$

OR

b) Find the fifth root of $(36 \cdot 64)^2 \times (4 \cdot 782)^3$.

29. a) Mr. Ramesh gets an annual income of 1,20,000 (without H.R.A). He pays Rs. 500 p.m. towards the income tax from his salary. He contributes a sum of Rs. 45,000 towards PF, NSC, NSS and LIC. What is his income tax due ?

OR

b) Mr. Suresh has an annual income of Rs. 1,30,000 excluding H.R.A. He donates Rs. 20,000 to a charitable institution and gets rebate of 50%. He contributes for PF, LIC Premium and NSC totally Rs. 65,000. What is the amount of income tax he has to pay ?

30. a) A cylindrical vessel of radius 42 cm contains water. Find the rise in the level of water if 9 spherical solids of radius 7 cm are dropped into it.

OR

b) A rectangular field 56 m × 22 m is irrigated through cylindrical pipe of radius 14 cm. Water flows at the rate of 12 km/hr. Find the time taken to irrigate to a depth of 20 cm.

31. a) Find the sum up to n terms of the series $0{\cdot}2 + 0{\cdot}22 + 0{\cdot}222 + \ldots\ldots\ldots$

OR

b) Find the three terms in G.P. whose sum is $10\frac{1}{2}$ and product is 27.

SECTION – D

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

$4 \times 5 = 20$

32. a) Simplify the following :

$$\frac{x^2 - x - 2}{x^2 - 3x + 2} + \frac{2x^2 + x - 3}{2x^2 + 5x + 3} - 2$$

OR

b) Simplify the following :

$$\frac{a^2 - 16}{a^3 - 8} \times \frac{2a^2 - 3a - 2}{2a^2 + 9a + 4} \div \frac{3a^2 - 11a - 4}{a^2 + 2a + 4}$$

33. a) If α and β are the roots of the equation $2x^2 - x - 6 = 0$, find the equation whose roots are α^3 and β^3.

OR

b) If the roots of the equation $x^2 - px + q = 0$ differ by unity, prove that $p^2 = 4q + 1$.

34. a) Resolve into partial fractions :

$$\frac{7x + 18}{x^2 + 5x + 6}$$

OR

b) Resolve into partial fractions :

$$\frac{9}{(x - 1)(x + 2)^2}$$

35. a) Find the L.C.M and G.C.D of $x^2 + x - 6$, $x^2 + 2x - 8$ and $2x^2 - 5x + 2$.

OR

b) The G.C.D and L.C.M of two polynomials are $(x - 4)$ and $(x - 4)(x + 5)(2x + 1)$ respectively. If one of the polynomials is $x^2 + x - 20$, find the other polynomial.

SECTION – E

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

$1 \times 10 = 10$

36. a) Solve graphically : $(x - 5)(x + 2) = 0$

OR

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