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. $(A - B) \cup (A - C)$ is

   a) $A - (B \cap C)$

   b) $A - (B \cup C)$

   c) $(A - B) \cap C$.

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

   a) -2

   b) 0

   c) -1.

3. If $\log x + \log 5 = \log 2$, then the value of x is

   a) $\frac{2}{5}$

   b) $\frac{5}{2}$

   c) 10.

4. The ratio of the radii of two spheres is 1 : 3, then the ratio of their volumes is

   a) 9 : 1

   b) 1 : 27

   c) 1 : 9.

5. The L.C.M. of $3x^2yz$; $4xy^3z^3$; $8x^3y^3z^4$ is

   a) $24\ x^3y^3z^4$

   b) $12\ x^2y^3z$

   c) $96\ xyz$.

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

   a) $\frac{bc}{a}$

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

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

7. The value of $\frac{a^2b + ab^2}{ab + b^2}$ is

   a) a

   b) $\frac{ab}{a+b}$

   c) 1.

8. The next term in the G.P. 4, $2\sqrt{2}$, 2, $\sqrt{2}$, ... is

   a) 1

   b) $\frac{1}{\sqrt{2}}$

   c) 2.

9. Volume of a cylinder whose radius is 7 cm and height is 10 cm, is

   a) 1540 cu. cm

   b) 3080 cu. cm

   c) 440 cu. cm.

10. The square root of $49\ a^6\ b^4\ c^2$ is

    a) $7\ a^3\ b^2\ c$

    b) $14\ a^2\ b^2\ c^2$

    c) $7\ a\ b^2\ c$.

SECTION – B

Note : i) Answer any *ten* questions.

ii) Each question carries *three* marks. $10 \times 3 = 30$

11. Given that $\xi = \{ x / 0 < x < 8, x \text{ is an integer} \}$

    $A = \{ x / 1 < x < 5, x \text{ is an integer} \}$ and

    $B = \{ x / x < 10, x \text{ is a prime number} \}$.

    find $A' \cap B'$.

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

13. If $f(x) = \sqrt{x} - \frac{1}{\sqrt{x}}$, find

(i) $f(16)$ (ii) $f(1)$ (iii) $f(36)$.

14. Given that $f(x) = ax + 3$ and $g(x) = 4 - x$. If $f \circ g = g \circ f$, find a.

15. Simplify :

$$\log_6 \frac{7}{12} + \log_6 \frac{3}{49} - \log_6 \frac{1}{56}.$$

16. Solve :

$$\log(3x - 1) + \log 4 = \log 44.$$

17. What is 'net taxable income' ? Also give the income tax slabs for the financial year 1997 – 1998 in the case of an individual.

18. A fraction is less than its reciprocal by $\frac{9}{20}$. Find the numbers.

19. Find the sum upto n terms of the G.P.

$$3, \frac{-9}{4}, \frac{27}{16}, \ldots\ldots\ldots\ldots$$

20. Find the 10th term of the G.P.

$$1, \frac{2}{3}, \frac{4}{9}, \frac{8}{27}, \ldots\ldots\ldots\ldots$$

21. The volume of a hemisphere is $718\frac{2}{3}$ cu. cm. Find its diameter.

22. A metal ball is a hollow sphere of external and internal diameters 10 cm and 4 cm respectively. Find the volume of metal used in it.

23. Find the L.C.M. of $x^3 - 27$; $4x^2 - 36$ and $3x^2 - 7x - 6$.

24. Simplify :

$$\frac{x^3 + 9x^2 + 20x}{x^2 + 5x + 4} + \frac{x^2 + 7x + 10}{x^2 + 3x + 2}$$

25. Find the square root of $(6x^2 - 5x + 1)(3x^2 + 5x - 2)(2x^2 + 3x - 2)$.

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) Prove by Venn diagram $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.

OR

b) In a group of 120 girls 52 know to dance, 65 know to act in a drama, 70 know to sing, 35 know to dance and act, 38 know to act and sing, 30 know to dance and sing. If 20 know all the three,

find

i) how many do not know to dance, act and sing

ii) how many know only one of them.

27. a) Let the functions $f: R \to R$; $g: R \to R$ be defined by $f(x) = x^2 - 3$ and $g(x) = \frac{x+1}{2}$. Prove that the composition of functions is not commutative.

OR

b) Let $f(x) = 1 + 3x$; $g(x) = x^2 - 2$ and $h(x) = 2 - 5x$ defined on real numbers. Show that $f \circ (g \circ h) = (f \circ g) \circ h$.

28. a) Find the value of $V = \frac{1}{3}\pi r^2 h$, when $\pi = 3{\cdot}14$; $r = 3{\cdot}712$ and $h = 17{\cdot}09$.

OR

b) Evaluate $\frac{(81{\cdot}07)^3}{(0{\cdot}0357)^2 \times \sqrt{113{\cdot}7}}$ using log tables.

29. a) Mr. Prabhu has a total income of Rs. 80,000 per annum (exclusive of HRA). He deposits Rs. 500 p.m. in P.F., Rs. 300 p.m. in NSS, Rs. 250 p.m. towards LIC premium and buys NSC for Rs. 4,000. Compute the amount of income tax he is required to pay.

OR

b) Jame'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 NSC. Find his income tax due.

is transferred into conical bottles of radius 5 cm and height 3 cm; find the number of conical bottles needed.

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) Find the sum upto n terms of the G.P.

$4 + 44 + 444 + \ldots\ldots\ldots\ldots$

OR

b) In a G. P. $t_5 = \frac{27}{16}$, $t_7 = \frac{243}{64}$, find the G.P.

SECTION – D

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

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

32. a) Simplify the following :

$$\frac{1}{a^2 + 7a + 12} + \frac{1}{a^2 + 5a + 6} + \frac{2}{a^2 + 6a + 8}.$$

OR

b) Simplify the following :

$$\frac{2a - 3}{2a^2 + 13a - 24} \times \frac{4a^2 - 3a - 7}{4a - 7} \div \frac{a^2 - 2a + 3}{a^2 + 5a - 24}.$$

their product. Find k.

OR

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

34. a) Resolve $\frac{5x + 4}{(2x + 3)(x - 2)}$ into partial fractions.

OR

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

35. a) Find the G.C.D. and L.C.M. of the following :

$2x^3 - 16x^2 + 30x$; $3x^2 - 12x + 9$; $6x^2 - 24x + 18$.

OR

b) When G.C.D. $= (x - 4)$; L.C.M. $= (x - 4)(x + 5)(2x + 1)$ and one of the polynomials is $x^2 + x - 20$, 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. 10

36. a) Solve $2x^2 - x - 6 = 0$ graphically.

OR

b) Draw the graph of $y = x^2 - 9x + 20$ and hence solve $x^2 - 11x + 30 = 0$.