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MATHEMATICS — Paper ITime 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 - ANote : Answer all the *ten* questions. $10 \times 1 = 10$ 1. If $A = \{1, 2, 3\}$ and $B = \{2, 4, 5, 6\}$, then $A - B$ is

- 1) $\{2\}$
- 2) $\{3\}$
- 3) $\{1, 3\}$.

2. If $f(x) = 2^x - 2$, then $f(2)$ is =

- 1) 2
- 2) 0
- 3) 8.

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3. If $\log 2 = 0.3010$, $\log 3 = 0.4771$, then $\log 24$ is

1) 0.7781

2) 0.1761

3) 1.3801

4. The 5th term of the G.P. 125, 25, 5, is

1) $\frac{1}{125}$

2) $\frac{1}{5}$

3) $\frac{1}{25}$

5. Volume of a sphere is

1) $4\pi r^3$

2) $\frac{4}{3}\pi r^3$

3) $\frac{2}{3}\pi r^3$

6. The curved surface area of a cylinder is

1) $2\pi rh$

2) $4\pi r^2$

3) πrl

7. The L.C.M. of $6x^2yz$, $8xy^2z^3$ and $12x^3y^3z^2$ is

1) $6xyz$

2) $12x^2y^2z^2$

3) $24x^3y^3z^3$

8. The value of $\frac{x^3 - y^3}{x - y}$ is

1) $x^2 - y^2$

2) $x^2 + xy + y^2$

3) $x^2 - 2xy + y^2$

9. The roots of the quadratic equation $x^2 - 7x - 18 = 0$ are

1) 9, -2

2) -9, 2

3) 9, 2

10. The square root of $\frac{100a^{10}b^{16}}{81}$ is

1) $\frac{10a^5b^8}{9}$

2) $\frac{10a^{10}b^4}{9}$

3) $\frac{10a^5b^8}{3}$

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SECTION - B

Note : Answer any ten questions.

$10 \times 3 = 30$

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

12. In a group of boys, 40 like to play Hockey, 75 like to play Cricket and 15 like both
the games. Find how many boys are in the group.

13. If $f(x) = \begin{cases} 2x-3, & -5 \leq x \leq 0 \\ x+2, & 1 \leq x \leq 5 \\ 3x-1, & 6 \leq x \leq 10 \end{cases}$

Find $f(0) - f(3) + 2f(7)$.

14. If $f(x) = 2x + 5$ and $g(x) = 3x$, find $f \circ g$.

15. Evaluate 76.51×0.03741 .

16. Find the number of significant digits in $(200)^{14}$.

17. Find the 7th term of the G.P. 9, 3, 1,

18. Find the sum up to 10 terms of the G.P. $\frac{1}{24}, \frac{1}{12}, \frac{1}{6}, \dots$

19. Mr. Narayanan earns Rs. 1,26,000 as annual income (excluding HRA). What is
his income tax?

20. Find the volume of a hemisphere of radius 21 cm.

21. Three spheres have their volumes in the ratio 8 : 27 : 64. Find the ratio of their
surface areas.

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

23. Find the G.C.D. of $x^3 + y^3$, $x^4 - y^4$.

24. Simplify $\frac{3a^2 + 7a - 6}{6a^2 - a - 2}$.

25. Find the square root of $x^4 - 4x^3 + 10x^2 - 12x + 9$.

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 : $(A \cap B)' = A' \cup B'$.

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.

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27. a) Given $f(x) = 3x + 2$, $g(x) = 1 - 7x$. Verify the commutative property of composition of two functions.

OR

- b) Given $f(x) = 2x + 5$, $g(x) = x + 3$, $h(x) = 3x + 1$.

Verify $f \circ (g \circ h) = (f \circ g) \circ h$.

28. a) Evaluate using logarithms : $\frac{0.7154 \times 4.193}{2149}$.

OR

- b) Find the value of $\frac{bRt}{V-b}$ if $b = 1.53$, $R = 2.835$, $V = 10.07$, $t = 532$.

29. a) Mr. Somu's annual income is Rs. 93,400 exclusive of HRA. He contributes Rs. 700 p.m. towards P.F., Rs. 3,600 towards L.I.C. and Rs. 2,800 towards N.S.S. and also Rs. 4,000 in N.S.C. Compute the income tax to be paid.

OR

- b) Mr. Shanker is an employee in a company. He pays Rs. 500 p.m. towards P.F. and Rs. 2,400 towards L.I.C. premium. If his annual income excluding HRA is Rs. 75,400, what is his income tax due ?

30. a) A solid metallic cone of radius 2 cm and height 8 cm is melted and recast into a solid sphere. Find the diameter of the sphere so formed.

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 three terms in a G.P. whose sum is 42 and product is 512.

OR

- b) Find the sum up to n terms of the series $3 + 33 + 333 + \dots$.

SECTION - D

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

4 × 5 = 20

32. a) Simplify the following :

$$\frac{1}{2m^2+3m-2} - \frac{1}{3m^2+7m+2} - \frac{1}{6m^2-m-1}$$

OR

- b) Simplify the following :

$$\frac{a^2-(b-c)^2}{(a-b)^2-c^2} \times \frac{b^2-(c-a)^2}{(b-c)^2-a^2} \times \frac{c^2-(a-b)^2}{(c-a)^2-b^2}$$

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

OR

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

34. a) Resolve into partial fractions $\frac{(5x-1)}{(x+2)(x+3)}$.

OR

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

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35. a) Find the L.C.M. of $x^2+8x+15$, $x^2+11x+30$, $x^2+9x+18$.

OR

b) The G.C.D. and L.C.M. of the two polynomials are $(x+3)$ and $(x+3)(x-8)(x+2)$. If one of the polynomials is $x^2-6x-16$, find the other polynomial.

SECTION - E

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

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36. a) Draw the graph of the equation $y = 2x^2 - x - 6$ and using it solve the equation $2x^2 - x - 6 = 0$.

OR

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