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

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

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

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

2.   In an identity function,

a)   domain and range are same

b)   domain and range are not same

c)   codomain and range are not same.

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3. If $\log 2 = 0.3010$, $\log 3 = 0.4771$, then $\log 6 =$

   a) 0.7781

   b) 1.2431

   c) 2.5678.

4. In a G.P. 2, $-\dfrac{4}{3}$, $\dfrac{8}{9}$, the common ratio is

   a) $-\dfrac{3}{2}$

   b) $\dfrac{2}{3}$

   c) $-\dfrac{2}{3}$.

5. If a person has invested Rs. 5,000 in a scheme under Section 88, his ta
   deduction will be

   a) Rs. 5,000

   b) Rs. 1,000

   c) Rs. 4,000.

6. Two cones have their base radii in the ratio 3 : 2 and their vertical heights in th
   ratio 2 : 3, their volumes are in the ratio

   a) 1 : 1

   b) 2 : 3

   c) 3 : 2.

7. The volume of a sphere of radius 3 cm is

   a) 36π cm^3

   b) 9π cm^3

   c) 18π cm^3.

8. The roots of a quadratic equation are real and distinct, if the discriminant Δ is

   a) > 0

   b) < 0

   c) $= 0$.

9. The L.C.M. of $a^2 + ab$, $ab + b^2$ is

   a) $a^2 + ab$

   b) $a + b$

   c) $ab(a + b)$.

10. The value of $\dfrac{25\, ab^4 c^3}{40\, a^2 b^3}$

   a) $\dfrac{5}{8}\, \dfrac{bc^3}{a}$

   b) $\dfrac{5}{8}\, abc^3$

   c) $\dfrac{5}{8}\, \dfrac{c^3}{ab}$.

SECTION – B

Note : i) Answer any *ten* questions.

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

11. If $A = \{2, 3, 5, 6, 8\}$, $B = \{2, 4, 6, 7, 9\}$ and $C = \{2, 3, 4, 6, 9, 10\}$, then

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

12. In a group of 110 students in a hostel, 66 like coffee, 64 like tea and 18 do not

   like both. Find how many like both.

13. Given that $f(x) = 3x - 1$, $x = \{0, 1, 2, 3\}$, find the range of the function.

14. Given that $f(x) = 2x + 3$, $g(x) = 5x + k$, find k if $f \circ g = g \circ f$.

15. Find the number of significant digits in $(2 \cdot 7)^{30}$.

16. Using logarithms evaluate $(25 \cdot 13)^3$.

17. Find the 4th term of G.P. $2, -\dfrac{4}{3}, \dfrac{8}{9}, \ldots$.

18. Find the sum upto infinity of the G.P. $36, 12, 4, \ldots$.

19. If a man's annual income excluding HRA is Rs. 75,000, what is his standard

deduction ?

20. Find the C.S.A. of hemisphere of diameter 42 cm.

21. Volume of a sphere is $1437\frac{1}{3}$ sq.cm. Find its radius.

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

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

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

25. Simplify : $\dfrac{6x^2 + 3xy}{4x^2 - y^2}$.

SECTION – C

26. a) Show by Venn diagram $(A \cup B)' = A' \cap B'$.

OR

b) In a group of 80 persons, 30 wear spectacles, 25 wear ties, 30 wear belts. 13 wear spectacles and ties, 9 wear ties and belts, 12 wear belts and spectacles. If 24 do not wear any of them, find how many wear all the three.

27. a) Given $f(x) = 5 - 3x$, $g(x) = ax + 7$, if $f o g(-1) = -4$, find a.

OR

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

28. a) Using logarithms evaluate : $\dfrac{0.7154 \times 4.193}{0.2149}$.

OR

b) Using logarithms find the value of $\dfrac{bRt}{V-b}$ if $b = 1.53$, $R = 2.835$, $V = 10.07$, $t = 532$.

29. a) Raman's monthly salary is Rs. 8,400 excluding HRA. He sav

Rs. 400 p.m. in the PF. He pays Rs. 2,000 towards LIC premium a

invests Rs. 5,000 in NSC. Compute the amount of tax to be paid.

OR

b) Mr. Madan gets an annual income of Rs. 1,30,000 (excluding HRA). H

pays Rs. 500 p.m. towards the income tax from his salary. His contributic

towards PF, LIC and CTD comes to Rs. 45,000. What is the balance

Income tax he has to pay at the end of financial year, if any ?

30. a) A solid is in the form of cylinder with hemispherical ends. The commo

radius is 35 cm and the maximum length is 100 cm. Find the volume of th

solid.

OR

b) A rectangular field of 40 m × 20 m is irrigated through a cylindrical pipe o

radius 14 cm. Water flows at the rate of 8 km/h. Find the time taken tc

irrigate to a depth of 30 cm.

31. a) Find the 3 terms in G.P. whose sum is 42 and the product is 512.

OR

b) Find the sum upto n terms of the series 5 + 55 + 555 + ...

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 :

$$\frac{1}{a+b} + \frac{1}{a-b} - \frac{2a}{a^2-b^2}$$

OR

b) Simplify :

$$\frac{m^2-m-12}{m^2-16} \div \frac{m^2+m-6}{m^2+8m+16}.$$

33. a) If the equation $\left(1+m^2\right)x^2 + 2mxc + c^2 - a^2 = 0$ has equal roots, show that $c^2 = a^2\left(1+m^2\right)$.

OR

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

34. a) Resolve into partial fractions :

$$\frac{5x+1}{(x+5)(x-3)}.$$

OR

b) Resolve into partial fractions : $\dfrac{x^2-6x+5}{(x-4)^3}.$

35. a) Find the G.C.D. and L.C.M. of x^2-4, x^2+3x+2, x^2+x-2.

OR

b) G.C.D. of 2 polynomials is $(x+3)$. The product of the 2 polynomials is $\left(x^2+x-6\right) \times \left(x^2-2x-15\right)$. Find their L.C.M.

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SECTION – E

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

   ii)   The question carries *ten* marks.

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36. a)   Solve graphically : $x^2 - x - 12 = 0$.

<div align="center">OR</div>

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

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