3921

Register Number | | | | | | |

MATHEMATICS — Paper I

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

PART – I

N. B. : i) This Part contains *two* Sections, **Section – A** and **Section – B**.

ii) **Section – A** contains Multiple Choice Questions. Answer *all* the 20 questions. Each question carries *one* mark.

iii) **Section – B** contains 15 questions. Answer any *ten* questions. Each question carries *two* marks.

SECTION – A

I. Choose the correct answer from the given alternatives : $20 \times 1 = 20$

1. The n^{th} term of the sequence 2, 5, 10, ... is

a) $n + 3$ b) $n^2 + 1$

c) $n^3 + 1$ d) $2n + 1$.

2. The number of terms in 6, 18, 54, ... 1458 is

a) 5 b) 7

c) 8 d) 6.

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3. In an A.P. the sum of the first n terms is $S_n = n^2 p$ and the sum of the first m terms is $S_m = m^2 p$ where m, n and p are positive integers and $m \neq n$, then S_p is

a) $n^2 S_p$ b) $\frac{m^2 p}{n^2}$

c) $(m^2 + n^2) p$ d) p^3.

4. The sum of $5 + 10 + 15 + \ldots + 250$ is

a) 6275 b) 6075

c) 6375 d) 6735.

5. The volume of a cylinder is 60 cm^3. The volume of a cone whose height and radius are the same as those of the cylinder is

a) 30 cm^3 b) 20 cm^3

c) 180 cm^3 d) 60 cm^3.

6. A cone and a cylinder are of same height. If the radii of their bases are in the ratio 3 : 5, then the ratio of their volumes is

a) 9 : 25 b) 25 : 3

c) 9 : 5 d) 3 : 25.

7. A solid sphere with total surface area 24 cm^2 is bisected into 2 hemispheres. The total surface area of any one of the hemispheres is

a) 18 sq.cm b) 6 sq.cm

c) 12 sq.cm d) 36 sq.cm.

8. $P \cup Q = \{5, 11, 14, 17, 19, 20\}$, $P \cap Q = \{14\}$.

If $P = \{5, 11, 14, 17\}$, then $Q =$

a) $\{17, 19, 20\}$ b) $\{14, 19, 17, 20\}$

c) $\{5, 14, 17, 19, 20\}$ d) $\{14, 19, 20\}$.

9. If $(a, 3)(7, b)$ represents an identity function, then the values of a and b are respectively

a) $(3, 7)$ b) $(7, 7)$

c) $(3, 3)$ d) $(7, 3)$.

10. If the domain of $f(x) = 3x^2$ is the set $A = \{-2, 0, 1\}$, then the range is

a) $\{4, 0, 3\}$ b) $\{0, 3, 9\}$

c) $\{3, 9, 27\}$ d) $\{0, 3, 12\}$.

11. If $f(x) = \frac{1}{x}$, $g(x) = -\frac{1}{x}$, then $fog =$

a) $\frac{1}{x}$ b) $-\frac{1}{x}$

c) $-x$ d) x.

12. The pre-images of 2 under the function

$f = \{(0, 1), (2, 2), (3, 2), (5, 8), (4, 8)\}$ are

a) 3 and 5 b) 0 and 2

c) 2 and 3 d) 5 and 4.

13. Vignesh deposits Rs. 100 every month as R.D. for $2\frac{1}{2}$ years. The amount deposited by Vignesh will be

a) Rs. 3,600 b) Rs. 3,000

c) Rs. 4,800 d) Rs. 3,500.

14. What is the half-yearly interest received on Rs. 25,000 in a bank on a fixed deposit for 2 years, if the rate of interest is 10% ?

a) Rs. 1,250 b) Rs. 2,500

c) Rs. 3,750 d) Rs. 5,000.

15. If the difference between C.I. and S.I. on Rs. 2,000 for 2 years is Rs. 20, then the rate of interest is

a) 10% b) 20%

c) 30% d) 15%.

16. When $f(x)$ is divided by $ax + b$, the remainder is

a) $f\left(\frac{a}{b}\right)$ b) $f\left(-\frac{a}{b}\right)$

c) $f\left(\frac{b}{a}\right)$ d) $f\left(-\frac{b}{a}\right)$.

17. The L.C.M. of $(x+1)^2(x-3)$ and $(x^2-9)(x+1)$ is

a) $(x+1)^3(x^2-9)$ b) $(x+1)^2(x^2-9)$

c) $(x+1)^2(x-3)$ d) $(x-9)(x+1)$.

18. The sum of 2 natural numbers is 8 and the sum of their reciprocals is $\frac{8}{15}$. Then the numbers are

a) 3 and 5 b) 6 and 2

c) 7 and 1 d) 4 and 4.

19. The partial fraction representation of $\frac{x+3}{(x+1)^2}$ is

a) $\frac{A}{(x+1)^2}$ b) $\frac{A}{(x+1)} + \frac{B}{(x+1)^2}$

c) $\frac{Ax+B}{x+1}$ d) $\frac{Ax+B}{(x+1)^2}$.

20. If one root of the equation $ax^2 + bx + c = 0$ is negative of the other, then

a) $c = 0$ b) $a = 0$

c) $b = 0$ d) $a = 0$ and $c = 0$.

SECTION – B

II. Answer any *ten* questions : $10 \times 2 = 20$

21. Find the $(n+1)^{th}$ term of the A.P., 45, 41, 37, ...

22. Find the sum to infinity of the G.P., 10, – 9, 8, 1, ...

23. Evaluate $1 + 4 + 9 + ... + 225$.

24. Find the height of the cylinder if its curved surface is 352 sq.cm and radius 3·5 cm.

25. The radius and height of a right circular cone are in the ratio 5 : 12. If its volume is 314 cu.cm, find the radius and height of the cone.

26. The circumference of the edge of a hemispherical bowl is 132 cm. Find its radius.

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

28. Let $f : A \to B$, where $A = \{1, 2, 3, 4, 5\}$, $B = \{5, 6, 7, 8, 9, 10\}$ defined by $f(x) = x + 4$. Find the co-domain and range of the function. Identify the function.

29. If $f(x) = 3x - 9$, $g(x) = 7x - 10$, find $g \circ f$.

30. The difference between S.I. and C.I. on a sum of money lent at $3\frac{3}{4}$ % per annum for 2 years is Rs. 27. Find the sum borrowed.

31. Balu deposits Rs. 100 every month in a bank paying 8% per annum S.I. on recurring deposit. How much will he get at the end of 5 years ?

32. Show that $3z + 10$ is a factor of $9z^3 - 27z^2 - 100z + 300$. Find also the other factors.

33. Simplify : $\frac{x}{x+y} - \frac{y}{x-y}$.

34. The sum of a number and its reciprocal is $2\frac{1}{30}$. Find the number.

35. If one root of the equation $3x^2 - 10x + 3 = 0$ is $\frac{1}{3}$, find the other root.

PART – II

N. B. : i) This Part contains *four* Sections, **Section – C**, **Section – D**, **Section – E** and **Section – F**.

ii) **Section – C** and **Section – E** contain *three* questions each. Answer any *two* questions in each Section.

iii) **Section – D** and **Section – F** contain *four* questions each. Answer any *three* questions in each Section.

iv) Each question carries *five* marks.

SECTION – C

III. Answer any *two* questions : $2 \times 5 = 10$

36. Find the 4 numbers in A.P. whose sum is 20 and the sum of whose squares is 120.

37. Find the sum of all 3-digit numbers which are divisible by 9.

38. $S_n = 1 + 4 + 4^2 + \ldots\ldots$ to n terms. Find the least value of n such that $S_n > 1500$.

SECTION – D

IV. Answer any *three* questions : $3 \times 5 = 15$

39. Using Venn diagram, verify $(A \cap B)' = A' \cup B'$.

40. If $P = \{3, 4, 5, 6, 8\}$, Q = set of real numbers and $f: P \to Q$ is defined by $f(x) = \frac{12}{x-2}$. Represent the function as (i) an arrow diagram, (ii) a set of ordered pairs, (iii) a table and (iv) a graph.

41. Joseph borrowed Rs. 62,500 from Murugan at the rate of 8% per annum. If after $1\frac{1}{2}$ years, a dispute arose whether S.I. or C.I. payable half-yearly should be charged, find the amount in dispute.

42. How much should Sneha deposit at the beginning of every month in a bank paying 5% S.I. per annum if she wants to get Rs. 6,636 at the end of 6 years ?

SECTION – E

V. Answer any *two* questions : $2 \times 5 = 10$

43. Water flows through a cylindrical pipe of internal radius 3·5 cm at 5 m/sec. Calculate the volume of water discharged in 1 minute.

44. Find the capacity of a bucket having the radius of the top as 36 cm and that of the bottom as 12 cm. Its depth is 35 cm.

45. The radii of the internal and external surfaces of a hollow spherical shell are 3 cm and 5 cm respectively. If it is melted and recast into a solid cylinder of height $2\frac{2}{3}$ cm, find the diameter of the cylinder.

SECTION – F

VI. Answer any *three* questions : $3 \times 5 = 15$

46. The polynomials $ax^3 + 3x^2 - 3$ and $2x^3 - 5x + a$, when divided by $x - 4$ leave the remainders R_1 and R_2 respectively. Find the value of a when $2R_1 - R_2 = 0$.

47. Find the values of a and b, if $x^4 - 10x^3 + 37x^2 + ax + b$ is a perfect square.

48. Resolve $\frac{4x - x^2 + 3}{(x-1)^3}$ into partial fractions.

49. If the equation $(1 + m^2)x^2 + 2mcx + (c^2 - a^2) = 0$ has equal roots, prove that $c^2 = a^2(1 + m^2)$.

PART – III

N. B. : i) This Section contains *two* questions. Answer any *one* question.

ii) Each question carries *ten* marks.

SECTION – G

VII. Answer any *one* question : $1 \times 10 = 10$

50. Draw the graph of $y = x^2 + 2x - 3$ and hence solve the equation $x^2 - x - 6 = 0$.

51. Solve graphically, $x^2 - 5x + 6 = 0$.