8421

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 number of terms in the A.P. 7, 13, 19, ... , 97 is

a) 97 b) 17

c) 16 d) 15.

2. The 6^{th} term of the G.P. $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \ldots\ldots$ is

a) $\frac{2}{81}$ b) $\frac{6}{81}$

c) $\frac{14}{90}$ d) $\frac{5}{91}$.

3. The sum of series $1 + 2 + \ldots\ldots + 90$ is

a) 9504 b) 4095

c) 5904 d) 9604.

4. In an Asoka Chakra, the central angles made by the smallest sector, two small sectors, three small sectors and so on are

a) in A.P.

b) equal

c) in G.P.

d) such that their summation is 360°.

5. The ratio of the total surface area of a solid hemisphere to the square of its radius is

a) $2\pi : 1$ b) $3\pi : 1$

c) $4\pi : 1$ d) $5\pi : 1$.

6. The area of cross-section of a cylinder is 22 cm^2. If its height is 14 cm, then its volume in cm^3 is

a) 154 b) 308

c) 616 d) 462.

7. The slant height of the cone whole base has the diameter 10 cm and whose height is 12 cm, is

a) 13 cm b) 12 cm

c) 6 cm d) 5 cm.

8. Composition of functions is

a) Associative

b) Commutative

c) Commutative and Associative

d) not Associative.

9. If $K(x) = 3x - 9$ and $L(x) = 7x - 10$, then L o K is

a) $21x + 73$ b) $-21x + 73$

c) $21x - 73$ d) $22x - 73$.

10. The pre-image of 5 under the function

$f = \{(2, -5), (3, 5), (4, -5), (5, 5)\}$ is

a) 2 and 3 b) 3 and 4

c) 3 and 5 d) 2 and 4.

11. If A, B, C are any three sets, then $A \cup (B \cap C)$ is

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

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

c) $(A \cap B) \cup (A \cup B)$

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

12. A comet is heading for Jupiter with acceleration $a = 50$ km s^{-2}. The velocity of the comet at time t is given by $f(t) = at^2 - at + 1$. Then the velocity at time $t = 5$ seconds is

a) 900 km s^{-1} b) 1001 km s^{-1}

c) 2001 km s^{-1} d) 50 km s^{-1}.

13. A recurring deposit of Rs. 50 per month at 10% S.I. per annum will fetch at the end of 2 years an interest of

a) Rs. 250 b) Rs. 125

c) Rs. 375 d) Rs. 500.

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

a) 10% b) 20%

c) 30% d) 15%.

15. Radha made a fixed deposit with a bank for 3 years paying 11% p.a. If she takes quarterly interest, the interest she gets on Rs. 1000 deposit is

a) Rs. 55 b) Rs. 27·50

c) Rs. 65·50 d) Rs. 25·70.

16. If the remainder, when $a - 2x + 5x^2$ divided by $x - 2$, is 7, then a is

a) 9 b) 7

c) -8 d) -9.

17. The quotient when $x^3 + x^2 - 7x - 3$ is divided by $x - 3$ is

a) $x^2 - x + 5$ b) $x^2 + 4x + 5$

c) $x^2 - 4x - 5$ d) $x^2 + 5x - 1$.

18. The G.C.D. of $4(x-1)^2(x+2)$ and $6(x-1)(x-2)$ is

a) $24(x-1)^2(x^2-1)$ b) $x - 1$

c) $2(x-1)$ d) $24(x-1)$.

19. If α and β are the roots of the equation $ax^2 + bx + c = 0$, then $(\alpha + \beta)^2$ is

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

c) $\frac{b^2}{a^2}$ d) $\frac{bc}{a}$.

20. The roots of the equation $x^2 - 8x + 12 = 0$ are

a) real and irrational b) real and rational

c) real and equal d) unreal.

SECTION - B

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

21. The 5^{th} term of an A.P. is 27 and the 8^{th} term is 12. Determine the A.P.

22. Evaluate $1 + 4 + 9 + \ldots + 1600$.

23. Find the sum to infinity of the G.P.

$\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}, \ldots\ldots$.

24. The surface areas of the two spheres are in the ratio 25 : 36. Find the ratio of their radii.

25. The area of the curved surface of the cylinder is 704 sq.cm and its height is 8 cm. Find the radius of the cylinder.

26. What is the lateral surface area of cone whose slant height is 10 cm and height is 8 cm ?

27. Let $A = \{ 0, 1, 2, 3 \}$, $B = \{ 1, 2, 5, 10, 16 \}$ and

$f = \{ (x, y) : y = x^2 + 1, \ x \in A \text{ and } y \in B \}$

a) List the elements of f.

b) What is the range of f?

28. Represent $(A \cap B)'$ in Venn diagram.

29. Given $A = \{ x \mid -4 < x \leq 4, \ x \in z \}$

$B = \{ 5, 4, 3, 1, 0, -1 \}$ and

$C = \{ -2, -1, 0, 3, 4 \}$

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

30. Find the difference between C.I. and S.I. on a sum of Rs. 5,000 for 2 years at 6% per annum.

31. A person deposits Rs. 40 in a bank every month at 10% S.I. How much interest will he get at the end of 3 years ?

32. Find the quotient and remainder when $x^3 + x^2 - 7x - 3$ is divided by $x - 3$.

33. Find the L.C.M. of $x^3 + x^2 + x + 1$, $x^3 + 2x^2 + x + 2$.

34. Multiply : $\frac{a^3 b^2}{a - 1}$ by $\frac{a^2 - 1}{a^2 b^3}$.

35. Decompose into partial fraction : $\frac{3x - 2}{(x - 1)^2}$.

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 3 questions each. Answer any *two* questions in each Section.

iii) **Section – D** and **Section – F** contain 4 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 four numbers in A.P. whose sum is 20 and the sum of whose squares is 120.

37. Find the sum to n terms of the series $7 + 77 + 777 + \ldots\ldots$ to n terms.

38. Find three numbers in G.P. such that their sum and product are respectively 14 and 64.

SECTION – D

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

39. Using Venn diagram, verify :

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

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

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

41. Aravind deposited Rs. 200 at the beginning of every month in recurring deposit and received Rs. 19,656 at the end of 6 years. Find the rate of simple interest paid by the bank.

42. Rahul deposited Rs. 5,000 in a bank which pays 6% S.I. per annum for 2 years. Ajay deposited on the same day Rs. 5,000 in another bank which pays 5·5% C.I. per annum. Who will get more interest and how much after 2 years ?

SECTION – E

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

43. A cup has the shape of a hemisphere surmounted by a cylinder. The diameter of the hemisphere is 6 cm. The total height of the cup and cylinder is 13 cm. Find its volume.

44. The curved surface area of a cone is 550 sq.cm. and the total surface area is 704 sq.cm. Find the radius and height of the cone.

45. Through a cylindrical tunnel of diameter 21 metre water flows uniformly at the rate of 18 km per hour. How much water will flow through it in 20 minutes ?

SECTION – F

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

46. Given that $px^2 + qx + 6$ leaves a remainder 1 on division by $2x + 1$ and $2qx^2 + 6x + p$ leaves a remainder 2 on division by $3x - 1$. Find p and q.

47. Decompose into partial fraction :

$$\frac{x}{(x+1)(x+2)(x+3)}.$$

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

49. If α and β are the roots of $2x^2 - 4x + 1 = 0$, form the equation whose roots are

a) $\frac{1}{\alpha}, \frac{1}{\beta}$ b) α^2, β^2.

PART – III

N. B. : i) This Section contains 2 questions. Answer any *one* question.

ii) Each question carries *ten* marks.

SECTION – G

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

50. Solve graphically the equation $x^2 - 4x + 3 = 0$.

51. Draw the graph of $y = x^2 - 2x - 8$ and hence solve the equation $x^2 - 2x - 15 = 0$.