8517

Register Number | | | | | | |

MATHEMATICS — Paper I

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

PART – I

SECTION – A

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

1. $1^2 - 2^2 + 3^2 - 4^2 + 5^2 - 6^2 + \ldots 2n$ terms =

1) $\frac{n(n+1)(2n+1)}{6}$ 2) $n(n+1)$

3) $-n(2n+1)$ 4) n^2.

2. If n, p, q are in G.P. , then the expression for p in terms of n and q is

1) $\frac{n}{q}$ 2) $(nq)^{\frac{1}{2}}$

3) $q^2 n$ 4) nq.

3. If $1^2 + 2^2 + \ldots + 10^2 = 385$, then $2^2 + 4^2 + 6^2 + \ldots + 20^2$ is

1) 770 2) 1150

3) 1540 4) 385×385.

4. The sum of the squares of all the elements in the set $P = \{ x / x \in N,\ x$ is odd and $1 < x \leq 13 \}$ is

1) 454 2) 448

3) 462 4) 440.

5. 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

1) 154 2) 308

3) 616 4) 462.

6. The diameter of the base of two cones are equal. If their slant heights are in the ratio 5 : 4, the ratio of their curved surface areas is

1) 5 : 4 2) 5 : 6

3) 4 : 5 4) 3 : 1.

7. The relation between the volume ' v ' of a sphere of radius ' r ' and its surface area ' s ' is

1) $v = \frac{2}{3}rs$ 2) $v = \frac{rs}{3}$

3) $v = \frac{4}{3}sr$ 4) $v = 4s$.

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

1) $\{17, 19, 20\}$ 2) $\{14, 19, 17, 20\}$

3) $\{5, 14, 17, 19, 20\}$ 4) $\{14, 19, 20\}$.

9. If $f(x)=\frac{1}{x}$ and $g(x)=\frac{-1}{x}$, then $f \circ g =$

1) $-x$ 2) $\frac{1}{x}$

3) $\frac{-1}{x}$ 4) x.

10. The pre-images of 3 under the function $f = \{(0, 1), (2, 3), (1, 4), (7, 3)\}$ are

1) 1 and 2 2) 2 and 7

3) 0 and 2 4) 1 and 7.

11. If $f(x)=kx+1$, $g(x)=3x+2$, then the value of k for which $fog = gof$ is

1) 3 2) 2

3) 1 4) 0.

12. If $A = \{1, 3, 5\}$, B is the set of integers and $f : A \to B$ defined by $f(x)=x^2-1$, then the range of f is

1) $\{1, 9, 25\}$ 2) $\{3, 9, 24\}$

3) $\{0, 8, 24\}$ 4) $\{0, 1, 9\}$.

13. Ram deposits Rs. 500 p.m. in R.D. for 6 years in a bank which pays 10% S.I. per annum. The effective period for the R.D. in years is

1) 6 2) 21

3) 216 4) 219.

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

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

3) Rs. 3,750 4) Rs. 5,000.

15. The difference between C.I. & S.I. on Rs. 6,000 for 2 years at 4% per annum is

1) Rs. 19·20 2) Rs. 9·60

3) Rs. 4·80 4) Rs. 12·40.

16. If $4x + 5y = 83$ and $\frac{3x}{2y} = \frac{21}{22}$ then $y - x =$

1) 3 2) 4

3) 7 4) 11.

17. The quotient when $2x^3 + x^2 - 5x + 2$ is divided by $x + 2$ is

1) $2x^2 + 3x + 1$ 2) $2x^2 - 4x + 1$

3) $2x^2 - 3x - 1$ 4) $2x^2 - 3x + 1$.

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

1) real and irrational 2) real and rational

3) real and equal 4) unreal.

19. The G.C.D. of $x^2 - 1$ and $x^2 + 2x - 3$ is

1) $x^2 - 1$ 2) $x + 1$

3) $x - 1$ 4) $x + 3$.

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

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

3) $\frac{A}{x-1}+\frac{B}{(x-1)^2}$ 4) $\frac{Ax}{x-1}+\frac{B}{(x-1)^2}$.

SECTION – B

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

21. Find the sum of $21^2 + 22^2 + \ldots + 35^2$.

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

23. Find the middle term of an A.P. –3, –1, 1, ... 33.

24. The ratio between the radius of the base and the height of a cylinder is 2 : 7. Find the radius of the cylinder if its volume is 5632 cu.cm.

25. If the slant height and diameter of a conical tomb are 25 m and 14 m respectively, find the volume of the conical tomb.

26. The surface area of a sphere is 1386 sq.cm. Find its volume.

27. If $\{(-6, a), (b, 4), (-2, c), (d, 7)\}$ is an identity function, find the values of a, b, c and d.

28. If $f : R \to R$ is defined by $f(x) = ax + 3$ and $g : R \to R$ is defined by $g(x) = 4x - 3$, find 'a' so that $f \circ g = g \circ f$.

29. Using membership table prove that $A - B = A \cap B'$

30. The difference between S.I. and C.I. on a sum of money lent at 8% p.a. for 2 years is Rs. 12. Find the sum lent.

31. A person opens an R.D. account paying Rs. 150 per month for 3 years. If the rate of interest is 12%, what is the amount of interest he gets at the end ?

32. If the quotient on dividing $2x^4 - 7x^3 - 13x^2 + 63x - 48$ by $x - 1$ is $2x^3 + ax^2 + bx + 45$, find a and b.

33. Simplify : $\frac{6x^2 - 5x + 1}{9x^2 + 12x - 5}$.

34. Determine the nature of roots of the equation $2x^2 - 3x + 4 = 0$.

35. When $x^3 + 3x^2 - kx + 4$ is divided by $x - 2$, the remainder is k. Find the value of k.

PART – II

SECTION – C

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

36. The sum of 3 numbers in A.P. is 12 and the sum of their squares is 56. Find the numbers.

37. Three numbers are in Arithmetic Progression and their sum is 15. If 1, 3, 9 are added to them respectively, they form a G.P. Find the numbers.

38. Find the sum to ' n ' terms of the series 6 + 66 + 666 + ...

SECTION – D

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

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

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

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

41. 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 ?

42. A bank pays 8% simple interest per annum on recurring deposits. If Selva wants to get an amount of Rs. 8,088 at the end of 3 years, find the monthly instalment.

SECTION – E

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

43. A hollow cylinder has a total surface area of 1320 sq.cm. If its internal diameter is 8 cm and height is 7 cm, find its external radius.

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. A solid metal cylinder of radius 14 cm and height 21 cm is melted down and recast into sphere of diameter 7 cm. Calculate the number of spheres that can be made.

SECTION – F

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

46. If $ax^3 + bx^2 + x - 6$ has $x + 2$ as a factor and leaves a remainder 4 when divided by $x - 2$, find the values of a and b.

47. Factorize : $x^3 + 6x^2 + 11x + 6$.

48. Decompose into partial fractions :

$$\frac{x-1}{(3x+2)(x+3)(x+4)}$$

49. If α and β are the roots of the equation $x^2 - 2x + 7 = 0$, form the equation whose roots are $\alpha^2\beta$, $\alpha\beta^2$.

PART – III

SECTION – G

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

50. Solve graphically $x^2 - x - 12 = 0$.

51. Draw the graph of $y = x^2 + 6x + 8$ and use it to solve $x^2 + 6x + 5 = 0$.