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MATHEMATICS — Paper ITime Allowed : $2\frac{1}{2}$ Hours]

[Maximum Marks : 100

PART - I

- Note :
- i) This Part contains *two* Sections, **Section - A** and **Section - B**.
 - ii) **Section - A** contains Multiple Choice Questions.
 - iii) **Section - B** contains 15 questions.

SECTION - A

Answer all questions.

 $20 \times 1 = 20$

I. Choose the correct answer from the given alternatives :

1. 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) $(nq)^{1/2}$

3) $q^2 n$

4) nq

2. If the sequence $a_n = 2n + 1$ is an A.P. then a and d are

1) 2, 3

2) 1, 2

3) 2, 4

4) 3, 2.

[Turn over

9. The pre-image of 5 under the function

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

1) 2 and 3

2) 3 and 4

3) 3 and 5

4) 2 and 4.

10. If $\{ (x, 4), (8, y) \}$ represents an identity function, then the values of x and y are

1) 4, 8

2) 4, 4

3) 8, 8

4) 8, 4.

11. Given $g(x) = 2x^2$, $h(x) = 1 - x$, then $g \circ h$ is

1) $2(1 - x)^2$

2) $1 - 2x^2$

3) $1 + x^2$

4) $1 + 2x^2$.

12. $f: N \rightarrow N$ is given by $f(x) = 2x + 1$, f is

1) into function

2) onto function

3) not a function

4) constant function.

13. The quarterly interest due under F.D. on Rs. 1,000 at 12% rate of interest is

1) Rs. 120

2) Rs. 40

3) Rs. 30

4) Rs. 60.

14. 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.

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

- 1) Rs. 3,600 2) Rs. 3,000
 3) Rs. 4,800 4) Rs. 3,500.

16. If $3x + 2$ is a factor of $P(x)$, then

- 1) $P\left(\frac{2}{3}\right) = 0$ 2) $P\left(\frac{3}{2}\right) = 0$
 3) $P\left(-\frac{2}{3}\right) = 0$ 4) $P\left(-\frac{3}{2}\right) = 0$.

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

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

18. $\frac{3-x}{x^2-9} =$

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

19. If α and β are the roots of the equation $x^2 - 7x + 8 = 0$, then the value of $\frac{1}{\alpha} + \frac{1}{\beta}$ is

- 1) $\frac{8}{7}$ 2) 7
 3) 8 4) $\frac{7}{8}$.

20. If one root of the equation is negative of the other in the equation

$ax^2 + bx + c = 0$, then

- 1) $c = 0$ 2) $a = 0$
 3) $b = 0$ 4) $a = 0$ and $c = 0$

SECTION - B

II. Answer any ten questions :

$$10 \times 2 = 20$$

21. If 10 times the 10th term of an A.P. is equal to 20 times its 20th term, show that the 30th term of the A.P. is zero.

22. Find the 5th term of the G.P. whose 3rd term is $\frac{3}{8}$ and 7th term is $\frac{3}{128}$.

23. Find the sum to infinity of the G.P. 10, -9, 0.81, ...

24. The volume of a cone is 1232 cu.cm. Determine the area of the base if its height is 24 cm.

25. The radius and the height of the cylinder are in the ratio 2 : 7. If the curved surface area of the cylinder is 352 sq.cm, find its radius.

26. The surface area of the sphere is 2464 sq.cm. Find its radius.

27. Given $A = \{-5, -2, -1, 0, 1, 3, 4\}$

$$B = \{-2, 0, 3, 5, 6, 7\}$$

and $C = \{-5, -1, 0, 4, 7, 8\}$

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

28. $A = \{3, 6, 9, 12\}$, $B = \{1, 2, 3, 4, 5, 6\}$ and $f: A \rightarrow B$ is defined by $f(x) = \frac{1}{3}x + 1$. Represent f as an arrow diagram.

29. Given $f(x) = 7x - 3$ and $g(x) = x^2 - 2$. Show that $f \circ g \neq g \circ f$.

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

31. If the quarterly interest on a sum kept in fixed deposit with a bank for 2 years paying 9% p.a. was Rs. 540, find the amount of deposit.

32. If the quotient on dividing $x^4 + 10x^3 + 35x^2 + 50x + 29$ by $x + 4$ is

$$x^3 + ax^2 + bx + 6, \text{ find } a \text{ and } b.$$

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33. Find the L.C.M. of $2(x^3 + x^2 - x - 1)$ and $3(x^3 + 3x^2 - x - 3)$.
34. Find the values of k for which the roots of the equation $kx^2 - 5x + k = 0$ are real and equal.
35. Form the quadratic equation whose roots are $7 + \sqrt{3}$ and $7 - \sqrt{3}$.

PART - II

Note : This Part contains four Sections, **Section - C**, **Section - D**, **Section - E** and **Section - F**.

SECTION - C

III. Answer any two questions :

$$2 \times 5 = 10$$

36. The sum of the three numbers in A.P. is 54 and their product is 5670. Find the numbers.
37. Three numbers whose sum is 15 are in A.P. If 1, 4 and 19 are added to them respectively, the results are in G.P. Find the numbers.
38. If S be the sum, P the product and R the sum of the reciprocals of n terms in a G.P., prove that $P^2 = \left(\frac{S}{R}\right)^n$.

SECTION - D

IV. Answer any three questions :

$$3 \times 5 = 15$$

39. A tooth-paste company interviewed 141 people in a city. It was found that 90 use brand A paste, 80 use brand B paste, 50 use brand C paste, 40 use both A and B, 28 use both B and C, 26 use both C and A, and 15 use all these three pastes. Find how many use (i) A and B and not C (ii) B only and (iii) C and A and not B.

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

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

V. Answer any two questions :

$$2 \times 5 = 10$$

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

44. A cone and a cylinder have bases of equal area. The height of the cone is 9 times that of the cylinder. If the cylinder can hold 150 cu.cm of water, what is the capacity of the cone ?

45. 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 is 13 cm. Find its volume.

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SECTION - F

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

46. Solve :

$$3x - 2y + z = 2$$

$$2x + 3y - z = 5$$

$$x + y + z = 6.$$

47. Show that $(y + 2)$ is a factor of $y^3 - 2y^2 - 29y - 42$. What are the other factors ?

48. A two digit number is such that the product of its digits is 12. When 36 is added to this number, the digits are interchanged. Find the number.

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

SECTION - G

VII. Answer any *one* question : $1 \times 10 = 10$ 50. Draw the graph of $y = x^2 - 2x - 8$ and hence solve the equation

$$x^2 - 2x - 15 = 0.$$

51. Solve graphically, $3x^2 - 5x + 2 = 0$.