**7421**

Register Number | | | | | | |

# MATHEMATICS — Paper I

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

## PART – I

### SECTION – A

Answer all questions. $20 \times 1 = 20$

I. Choose the correct answer from the given alternatives :

1. For an A.P. $S_n = n^2 - n + 1$. The second term of the series is

   1) 2 2) 3

   3) 4 4) – 2.

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

   1) 97 2) 17

   3) 16 4) 15.

3. A radioactive sample decays and the remaining sample at infinite time is given by $b = 1-\left(\frac{1}{2}+\frac{1}{4}+ \text{ ..... to } \infty\right)$, then $b$ is

   1) 0 2) 1

   3) $\frac{1}{\sqrt{2}}$ 4) $\frac{1}{2}$.

[ Turn over

4. The sum of 3 + 6 + 9 + .....+ 60 is

1) 360 2) 630

3) 600 4) 610.

5. If the radius of the base of a cone is doubled and the height is tripled then the volume is

1) made six times 2) made twelve times

3) made four times 4) made two times.

6. The curved surface area of a cylinder of base diameter 14 cm is 440 sq.cm. Its height is

1) 7 cm 2) 14 cm

3) 10 cm 4) 22 cm.

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

1) 18 $cm^2$ 2) 6 $cm^2$

3) 24 $cm^2$ 4) 36 $cm^2$.

8. Given $f(x) = (-1)^x$ is a function from $N$ to $Z$. The range of $f$ is

1) $\{1\}$ 2) $N$

3) $\{1, -1\}$ 4) $Z$.

9. Given $A$ and $B$ are sets and $A - B = A$, then

1) $A$ and $B$ are disjoint sets 2) $A$ and $B$ are overlapping sets

3) $B$ is a subset of $A$ 4) $A$ is the subset of $B$.

10. If $f : X \rightarrow Y$, where $X = \{ 1, 2, 3, 4 \}$, $Y = \{ 5, 6 \}$ is given by $f = \{ (1, 5), (2, 5), (3, 6), (4, 6) \}$, then $f$ is a

1) one-one function
2) many-one function
3) constant function
4) one-one onto function.

11. If $g(x) = x^2$; $h(x) = 2x + 1$ then $g \circ h$ is

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

12. If $\{ (4, 5), (5, x) \}$ represents a constant function then the value of $x$ is

1) 3
2) 4
3) 5
4) 6.

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

1) Rs. 250
2) Rs. 125
3) Rs. 375
4) Rs. 500.

14. The quarterly interest due on Rs. 1000 at 12% rate of interest is

1) Rs. 120
2) Rs. 40
3) Rs. 30
4) Rs. 60.

15. If the difference between C.I. and S.I. on Rs. 2800 for 2 years is Rs. 7, then the rate of interest is

1) 8%
2) 20%
3) 10%
4) 5%.

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

1) $a = c$ 2) $a = b$

3) $b = c$ 4) $c = 0$.

18. 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) $\frac{Ax+B}{x+1}+\frac{Cx+D}{(x+1)^2}$.

19. The H. C. F. of $2(x^2-4)$ and $4(x^2-9)(x+2)$ is

1) $4(x^2-4)$ 2) $(x-2)(x^2-9)$

3) $2(x+2)$ 4) $2(x^2-9)(x+2)$.

20. $\frac{a^2}{a^2-b^2} + \frac{b^2}{b^2-a^2} =$

1) $a - b$ 2) $a + b$

3) $a^2-b^2$ 4) 1.

## SECTION – B

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

21. For what value of $n$, the $n$th term of the series 3 + 10 + 17 + ..... and 63 + 65 + 67 + ..... are equal ?

22. Which term of the progression 1, 2, 4, 8, ..... is 512 ?

23. Evaluate :

    26 + 27 + ..... + 65.

24. The volume of a cylinder is 448 $\pi$ cu. cm and height 7 cm. Find its curved surface area.

25. Two cones have their heights in the ratio 5 : 3 and the radii of their bases in the ratio 2 : 1. Find the ratio of their volumes.

26. 8 metallic spheres each of radius 2 cm are melted and cast into a single sphere. Calculate the radius of the new sphere.

27. Given $f(x) = 3x - 2$, $g(x) = kx + 3$; find $k$ so that $f \circ g = g \circ f$.

28. Given $A = \{-8, -7, -5, 1, 2, 4\}$; $B = \{-7, 1, 3, 4, 5, 6\}$; $C = \{-8, -5, 2, 4, 6, 7\}$. Find $A - (B \cup C)$.

29. Let $A = \{0, 1, 2, 3\}$; $B = \{1, 2, 5, 10, 16\}$ and $f = \{(x, y) : y = x^2 + 1, x \in A \text{ and } y \in B\}$. List the elements of $f$ and identify the function.

30. The difference between S.I. & C.I. for 2 years on a sum of money lent at $6\frac{2}{3}\%$ is Rs. 14. Find the sum.

[ Turn over

31. Swamy deposited Rs. 3000 in a bank as a fixed deposit for 2 years paying 10% p.a. and receives interest half yearly. Find the interest received by him in 2 years.

32. For what value of $m$ is $2x^3 - x^2 - 3mx - 24$ exactly divisible by $x - 2$ ?

33. Given $p(x-1) + q(x-3) \equiv 5x - 9$; find the values of $p$ and $q$.

34. If $\alpha$ and $\beta$ are the roots of the equation $3x^2 - 6x + 4 = 0$, find the value of $\alpha^2 + \beta^2$.

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

## PART – II

### SECTION – C

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

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

37. If $S_1$, $S_2$, $S_3$ be the sum to $n$, $2n$ and $3n$ terms respectively of an A.P., show that $S_3 = 3(S_2 - S_1)$.

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

### SECTION – D

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

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

40. If $A = \{-3, -1, 1, 3\}$, $B = \{0, 1, 2, 3, 4,\}$ and $f : A \rightarrow B$ is defined by $f(x) = \frac{3-x}{2}$, represent the function as

i) an arrow diagram

ii) a set of ordered pairs

iii) a table

iv) a graph.

41. Seba deposited Rs. 14,000 as a special deposit for 3 years and the interest was compounded yearly at the rate of 10% p.a. Find the maturity value of the deposit.

42. Sita invests Rs. 25 in a bank at the beginning of each month for 36 months. If she gets Rs. 1066·50 at the end of 36 months, find the rate of interest.

## SECTION – E

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

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

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. A hemispherical bowl has volume of material $\frac{122\pi}{3}$ c.c. Its external diameter is 10 cm. Find its thickness.

## SECTION – F

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

46. $R_1$ and $R_2$ are the remainders when the polynomials $x^3+2x^2-5ax-7$ and $x^3+ax^2-12x+6$ are divided by $x + 1$ and $x - 2$ respectively. If $2R_1+R_2=6$, find the value of $a$.

47. Decompose into partial fractions : $\frac{x}{(x+1)(x+2)(x+3)}$.

48. If $9x^4+12x^3+28x^2+ax+b$ is a perfect square, find the values of $a$ and $b$.

49. If $\alpha$ and $\beta$ are the roots of the equation $x^2-3x-4=0$, form the equation whose roots are $\frac{1}{\alpha^2}, \frac{1}{\beta^2}$.

## PART – III

## SECTION – G

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

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

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