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

   a) $\dfrac{n}{q}$ b) $(nq)^{1/2}$

   c) $q^2 n$ d) nq.

[Turn over

3. The third term of the sequence whose n^{th} term $t_n = (n+1)(n+2)$ is

   a) 6   b) 12

   c) 20   d) 9.

4. $\sum n^3 =$

   a) $(\sum n)^3$ b) $(\sum n)^2$

   c) $\dfrac{n(n+1)(2n+1)}{6}$ d) $\dfrac{n(n+1)}{2}$.

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

   a) 154   b) 308

   c) 616   d) 462.

6. The radius of base of a cone is 5 cm and its height is 12 cm. The slant height of the cone is

   a) 13 cm   b) 17 cm

   c) 7 cm   d) 60 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 hemisphere is

   a) 18 cm^2 b) 6 cm^2

   c) 24 cm^2 d) 36 cm^2.

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

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

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

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

    a) A and B are disjoint sets   b) A and B are overlpping sets

    c) B is a subset of A d) A is the subset o B.

10. X gene in a plant is responsible for red flowers and gene for white flowers. If both are present, then the flowers produed are pink. If 20 plants have X gene, 20 plants have Y gene and there re 30 plants in all, then the total number of plants producing pink flower s

    a)   13   b)   10

    c)   20   d)   30.

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

    a) $\{1\}$ b) N

    c) $\{1, -1\}$ d) Z.

12. The pre-image of 5 under the function

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

    a)   2 and 3   b)   3 and 4

    c)   3 and 5   d)   2 and 4.

13. What is the half-yearly interest received for Rs. 25,00 in a bank on a fixed deposit for 2 years, if the rate of interest is 10% ?

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

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

14. Vignesh deposited Rs. 100 every month as Recurring De sit for $2\frac{1}{2}$ years. The amount deposited by Vignesh was

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

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

[Turn over

15. A recurring deposit of Rs. 80 per month for 5 years at 8% simple interest per year yields an interest of

a) 80×5

b) $80 \times \dfrac{60 \times 61}{2 \times 12} \times \dfrac{8}{100}$

c) $80 \times \dfrac{69}{12} \times \dfrac{8}{100}$

d) $80 \times 5 \times 12 \times \dfrac{8}{100}$.

16. The HCF of $\left(x^2 + 1 \right)$ and $\left(x^4 + 1 \right)$ is

a) $\left(x^2 + 1 \right)$

b) $(x + 1)$

c) 1

d) 0.

17. The degree of the polynomial $x^3 + 3x + x^6 + 2x^4$ is

a) 5

b) 3

c) 2

d) 1.

18. The square root of $9x^2 + 30xy + 25y^2$ is

a) $3x + 5y$

b) $3x - 5y$

c) $-3x + 5y$

d) $9x + 25y$.

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

a) $\dfrac{8}{7}$

b) 7

c) 8

d) $\dfrac{7}{8}$.

20. The nature of the roots of $x^2 + ax + bx + ab = 0$ is

a) real, distinct and rational

b) real, distinct and irrational

c) not real

d) real and equal.

SECTION – B

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

21. Find the 10th term of the A.P. 100, 96, 92, ...

22. A ball is dropped from a height of 6 m and on each bounce it rebounces to $\frac{2}{3}$ of its previous height. What is the total length of the downward paths ?

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

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

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

26. The volume of a sphere is numerically equal to its surface area. Find its diameter.

27. If $f : Z \to N$ is defined by $f(x) = x + 1$, test whether $f(x) = x + 1$ is a function or not. Give reason.

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

29. If $f(x) = 2x^2$ and $g(x) = 3x - 1$, find $f \circ g$ and $g \circ f$.

30. Ajay deposited Rs. 5,000 in a bank which pays 5·5% Compound Interest per annum. How much interest will he receive after 2 years ?

31. Radha made a fixed deposit with a bank for 3 years paying 11% per annum. If she takes quarterly interest, find the interest she gets on Rs. 1,000 deposit.

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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. Factorize : $x^3 - 2x^2 - 5x + 6$.

34. Simplify : $\dfrac{y^2 - 2y}{y + 2} \times \dfrac{3y + 6}{y - 2}$.

35. Form the equation whose roots are $7 + \sqrt{3}$ and $7 - \sqrt{3}$.

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. In an A.P., the sum of the first 10 terms is 175 and the sum of the next 10 terms is 475. Find the A.P.

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

38. If a^2, b^2, c^2 are in A.P., show that $\dfrac{1}{b + c}$, $\dfrac{1}{c + a}$, $\dfrac{1}{a + b}$ are also in A.P.

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. 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. How much one should deposit every month in a bank paying 5% S.I. per annum on monthly recurring deposit, if at the end of 6 years one wants to get Rs. 3,318 ?

42. Which is better investment : — Rs. 2,000 in a fixed deposit with a bank for 3 years, the interest being compounded half-yearly at the rate of 10% (or) Rs. 60 per month in a recurring deposit with a bank paying simple interest of 10% per annum for 36 months ?

SECTION – E

V. Answer any *two* questions :

$2 \times 5 = 10$

43. A lead pencil is in the shape of a cylinder. If the pencil is 28 cm long, radius 4 mm and the lead is of radius 1 mm, find the volume of the wood used in the pencil.

44. A semicircular plate of tin has a diameter 40 cm. It is made into an open conical vessel by bringing the radii together and soldering. Find the capacity of the vessel.

45. A hollow spherical shell has an inner radius of 8 cm. If the volume of material is $\frac{1952 \pi}{3}$ c.c., find the thickness of the shell.

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SECTION – F

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

46. In a ration shop, the sale of sugar, rice and wheat were as follows :

	Sugar (in kg)	Rice (in kg)	Wheat (in kg)	Sale (Amount)
Monday	1	4	3	78
Tuesday	2	5	7	126
Wednesday	1	6	4	108

Find the sale price of each item per kg.

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

48. Decompose into partial fraction : $\dfrac{x^2 + x + 1}{(x - 2)^2 (x + 2)}$.

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

PART – III

N. B. : i) The Part contains Section – G

ii) Answer any *one* question.

iii) Each question carries *ten* marks.

SECTION – G

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

50. Draw the graph of $y = (x - 6) (x - 3)$ and hence solve the equation $x^2 - 7x + 12 = 0$.

51. Solve graphically : $x^2 - x - 12 = 0$.