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MATHEMATICS — Paper I

Time Allowed : $2\frac{1}{2}$ Hours]

Maximum Marks: 100

PART - I

- This Part contains two Sections, Section A and Section B. N. B.: i)
 - Section A contains Multiple Choice Questions. Answer all the ii) 20 questions. Each question carries one mark.
 - Section B contains 15 questions. Answer any ten questions. Each iii) question carries two marks.

SECTION - A

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

- The n^{th} term of the sequence 1, 3, 7, 15, is
 - 2n + 1

n-1c)

- d) $2^{n}-1$.
- A radioactive sample decays and the remaining sample at infinite time is given by $b = 1 - (\frac{1}{2} + \frac{1}{4} + ... + \infty)$. Then *b* is
 - a)

c)

[Turn over

| 3 | Value of $\frac{1^3 + 2^3 + 3^3 + \dots + 1}{1 + 2 + 3 + \dots + 1}$ | $\frac{10^3}{10}$ is |
|----|--|--|
| | a) 45 | b) 55 |
| | c) 385 | d) 285. |
| 4. | The first term of an A.P. is 5 | 5 and its 100 th term is - 292, then its 51s |
| | term is | Inte Allowed: 2 Hours] |
| | a) - 142 | b) - 149 |
| | c) 145 | d) - 145. |
| 5. | The area of cross-section of a | cylinder is 22 cm ² . If its height is 14 cm, |
| | then its volume is | |
| | a) 154 cu.cm | b) 308 cu.cm |
| | c) 616 cu.cm | d) 462 cu.cm. |
| 6. | If the radius of the base of a then the volume is | cone is doubled, and the height is tripled, |
| | a) made 6 times | b) made 12 times |
| | c) made 4 times | d) made 2 times. |
| 7. | The ratio of the total surface ar | ea of a solid hemisphere to the square of its |
| | radius is | |
| | a) $3\pi:1$ | b) 2π:1 |
| | c) $4\pi:1$ | d) 14π:1. |
| 8. | If A and B are any two sets, the | $n(A \cap B)^{T}$ is |
| | a) A'∩B | b) A ∪ B |
| | c) A' U B' | d) A' ∩ B' |

| 9. | The | pre-images | of | 3 | under | the | function |
|----|-----|------------|----|---|-------|-----|----------|
|----|-----|------------|----|---|-------|-----|----------|

$$f = \{ (0, 1), (2, 3), (1, 4), (7, 3) \}$$
 are

a) 1 and 2

b) 2 and 7

c) 0 and 2

d) 1 and 7.

10. If $A = \{1, 3, 5\}$, B is the set of integers and $f: A \rightarrow B$ defined by

 $f(x) = x^2 - 1$, then the range of f is

a) { 1, 9, 25 }

b) {3, 9, 24}

c) { 0, 8, 24 }

d) {0, 1, 9}.

11. Composition of functions is

a) Associative

- b) Commutative
- c) Commutative and Associative d) not Associative.
- 12. If $A = \{ 2, 5, 7 \}$, $B = \{ 5, 8, 10 \}$, then

$$f = \{(2, 5), (5, 8), (7, 10), (5, 10)\}$$
 is

- a) one-one into function
- b) many-one function
- c) constant function
- d) not a function.
- 13. Ram deposits Rs. 50 per month for 2 years. At the end of 2 years, he receives Rs. 1,800 as the maturity value. Then the interest paid by the bank is
 - a) Rs. 800

b) Rs. 100

c) Rs. 600

- d) Rs. 300.
- 14. The quarterly interest received on Rs. 24,000 in a fixed deposit with a bank for 2 years paying 9% per annum is
 - a) Rs. 240

b) Rs. 540

c) Rs. 270

d) Rs. 360.

- 15. If the difference between C.I. and S.I. on Rs. 6,000 for 2 years is Rs. 9.60, then the rate of interest is
 - a) 6%
- That I d b) 10%
- 12% d) 4%.
- 16. If $P(x) = 2x^3 9x^2 + x + 12$ and $P\left(\frac{3}{2}\right) = 0$, then by factor theorem, the corresponding factor of P(x) is
 - 2x + 1a)

b)

2x - 1

- 17. The G.C.D. of 4 $(x-1)^2(x+2)$ and 6 (x-1)(x-2) is
 - 24 $(x-1)^2 (x^2-1)$ b) (x-1)

- 2(x-1) d) 24(x-1).
- 18. The partial fraction representation of $\frac{x}{(x+1)^2}$ is

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

Ax + B

- d) $\frac{Ax+B}{x+1} + \frac{Cx+D}{(x+1)^2}$.
- 19. If α and β are the roots of $ax^2 + bx + c = 0$, then $(\alpha + \beta)^2$ is
 - a) $-\frac{b^2}{a^2}$

- d) $\frac{bc}{a}$.
- 20. The roots of $x^2 8x + 12 = 0$ are
 - real and irrational a)
- real and rational b)
- real and equal
- unreal. d)

SECTION - B

II. Answer any ten questions:

 $10 \times 2 = 20$

- 21. Find the middle term of an A.P. 3, 1, 1, ..., 33.
- 22. Find the sum of $21^2 + 22^2 + ... + 35^2$.
- 23. Which term of the progression 1, 2, 4, 8, ... is 512?
- 24. The radii of two cylinders are in the ratio 2: 3. Find the ratio of their volumes if their heights are in the ratio 5: 3.
- 25. The curved surface area of a cone is 550 sq.cm. and the total surface area is 704 sq.cm. Find its radius.
- 26. The volume of a sphere is numerically equal to its surface area. Find its diameter.
- 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 $P = \{-2, -1, 0, 1\}$, $Q = \{1, -2, 6, -3\}$ and $R = \{(x, y) / y = x^2 3, x \in P, y \in Q\}$, list the elements of R and identify the function.
- 29. 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 $f \circ g = g \circ f$.
- 30. If the difference between S.I. and C.I. for 3 years at 5% per annum is Rs. 61, find the principal.
- 31. A person opens an R.D. account paying Rs. 150 per month for 3 years. If the rate of interest is 12% per annum, what is the amount of interest he gets at the end of 3 years?

- 32. Find the value of k, if the division of $kx^3 + 9x^2 + 4x 10$ by x + 3 leaves the remainder 5,
 - 33. Simplify: $\frac{6x^2 5x + 1}{9x^2 + 12x 5}$
 - 34. If (2A+B)x+(A+B) = 11x+7, find the values of A and B.
 - 35. The sum S of first n natural numbers is given by the formula $S = \frac{n(n+1)}{2}$. If S = 231, find n.

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 3 numbers in G.P. whose sum if 14 and product is 64.
- 38. Find the sum of n terms of the series $0.4 + 0.94 + 0.994 + \dots$

SECTION - D

IV. Answer any three questions:

 $3 \times 5 = 15$

- 39. Verify $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ using Venn diagram.
- 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 $5\frac{1}{2}$ % C.I. per annum. Who will get more interest and how much?
- 42. At the end of 3 years, a recurring deposit fetches Rs. 16,398 with 9% S.I. per annum. Find the amount to be deposited every month.

SECTION - E

V. Answer any two questions:

 $2 \times 5 = 10$

- 43. A hollow cylindrical iron pipe is 40 cm long. Its outer and inner diameters are 8 cm and 5 cm respectively. Find the volume of the material and the weight of the pipe if 1 c.c. of iron weighs 7 gm.
- 44. A right circular cone of height 40 cm and base radius 15 cm is casted into smaller cones of equal sizes with base radius 5 cm and height 4 cm. Find how many cones are made.
- 45. A hollow spherical shell has an inner radius of 8 cm. If the volume of the material is $\frac{1952\pi}{3}$ c.c., find the thickness of the shell.

SECTION - F

VI. Answer any three questions:

 $3 \times 5 = 15$

- 46. If both x-2 and $x-\frac{1}{2}$ are factors of px^2+5x+r , show that p=r.
- 47. Resolve into partial fractions:

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

- 48. Find the values of a and b if $\frac{1}{x^4} \frac{6}{x^3} + \frac{13}{x^2} + \frac{a}{x} + b$ is a perfect square.
- 49. If α and β are the roots of the equation $2x^2 3x 4 = 0$, form the equation whose roots are $\frac{1}{\alpha^2}$, $\frac{1}{\beta^2}$.

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

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

" 44. A right chruits cope of height 40 cm and bese radius 15 cm is carried into

$$x^2 - 3x - 4 = 0$$
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