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**MATHEMATICS — Paper I**Time Allowed :  $2\frac{1}{2}$  Hours ]

[ Maximum Marks : 100

*Instruction :* Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

- N. B. :*
- i) Read the instructions under each Section carefully, before you start answering.
  - ii) Diagrams may be drawn wherever necessary.
  - iii) Rough work should be done at the bottom of the pages of the answer-book.

**SECTION - A**

*Note :* Answer all the ten questions.

$10 \times 1 = 10$

1. If  $A = \{1, 2, 3, 4, 5\}$  and  $B = \{1, 2, 3, 5, 7\}$ , then  $n(A \cap B)$  is
  - 1) 4
  - 2) 5
  - 3) 6
2. If  $f = \{(2, 6), (3, x)\}$  defines a constant function, then the value of  $x$  is
  - 1) 3
  - 2) 2
  - 3) 6.

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3. If  $\log x = 5 \log 2$ , then  $x$  is

1) 16

2) 32

3) 64.

4. The common ratio of the G.P.  $\frac{10}{3}, \frac{20}{9}, \frac{40}{27}$  is

1)  $\frac{3}{2}$

2)  $\frac{2}{3}$

3)  $\frac{2}{9}$ .

5. Volume of a hemisphere is

1)  $4 \pi r^3$  cu. units

2)  $\frac{4}{3} \pi r^3$  cu. units

3)  $\frac{2}{3} \pi r^3$  cu. units.

6. The curved surface area of a cone is

1)  $2 \pi r h$  sq. units

2)  $4 \pi r^2$  sq. units

3)  $\pi r l$  sq. units.



7. The G.C.D. of  $a^2 + ab$ ,  $a^2 - b^2$  is

1)  $a + b$

2)  $a - b$

3)  $ab$ .

8. The value of  $\frac{x^2 - y^2}{x + y}$  is

1)  $x + y$

2)  $x - y$

3)  $x^2 - y^2$ .

9. The roots of the quadratic equation  $ax^2 + bx + c = 0$  are real and equal if

1)  $b^2 - 4ac > 0$

2)  $b^2 - 4ac = 0$

3)  $b^2 - 4ac < 0$ .

10. The square root of  $16x^4y^6$  is

1)  $4x^2y^3$

2)  $2xy^2$

3)  $4xy^2$ .

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## SECTION - B

Note : Answer any ten questions.

10 × 3 = 30

11. If  $A = \{2, 5, 7\}$ ,  $B = \{1, 2, 3\}$  and  $C = \{3, 5, 6\}$ , find  $(A - B) \cup (A - C)$ .
12. In a class, 55 passed in Science, 39 passed in Mathematics and 20 passed in both. Find the strength of the class.
13. If  $f(x) = \begin{cases} 4x + 1, & -2 \leq x \leq 3 \\ x^2 + 1, & 4 \leq x \leq 8 \\ 3x + 2, & -6 \leq x \leq -3 \end{cases}$
- find  $2f(0) + f(4) - f(-4)$
14. If  $f(x) = \frac{1}{x}$  and  $g(x) = x + 1$ , find  $g \circ f(x)$ .
15. Evaluate  $0.7615 \times 19.71$ .
16. Find the number of zeros between the decimal point and the first significant digit in  $(0.047)^{15}$ .
17. Find the 12th term of the G.P. 81, 27, 9, .....
18. Find the sum up to  $n$  terms of the G.P. 2, 4, 8, .....
19. Mr. Kannan, an income tax assessee, deposits Rs. 600 p.m. in P.F., Rs. 5,800 in LIC premium, purchases NSC worth Rs. 5,000. Find the rebate amount he gets under Section 88.
20. Find the surface area of a sphere of radius 28 cm.
21. T.S.A. of a hemisphere is  $115\frac{1}{2}$  sq. cm. Find its volume.
22.  $\alpha$  and  $\beta$  are the roots of  $x^2 - 2x - 3 = 0$ . Find the values of  $\alpha^2 + \beta^2$ .
23. Find the L.C.M. of  $a^2 + ab$ ,  $ab - b^2$ ,  $a^2 - b^2$ .
24. Simplify :  $\frac{x^2 - 5x + 6}{x^2 - 6x + 9}$ .
25. Find the square root of :  $x^4 - 6x^2y^2 + 9y^4$ .



## SECTION - C

Note : Answer all the questions, choosing either (a) or (b) in each question.

6 × 5 = 30

26. a) Verify by Venn diagram :  $A - (B \cap C) = (A - B) \cup (A - C)$ .

OR

- b) In a group of students 40 passed in English, 50 in Mathematics, 60 in Science, 18 passed in English and Mathematics, 27 passed in Mathematics and Science, 20 passed in Science and English. If 7 passed in all the three, find the total number of students.

27. a) Given  $f(x) = 3x - 2$ ,  $g(x) = 5x + 3$ . Verify the commutative property of composition of functions.

OR

- b) Given  $f(x) = 1 - 3x$ ,  $g(x) = 2 - 5x$ ,  $h(x) = 3 - 7x$ . Verify  $ho(gof) = (hog)$  of

28. a) Find the cube root of 5944 and multiply it by the inverse of 2.527 using log tables.

OR

- b) Find  $T$ , if  $T = 2\pi \sqrt{l/g}$ , given  $l = 36$ ,  $g = 980$ ,  $\pi = 3.14$ .

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29. a) Mr. Robson, an executive in a company, gets an annual income of Rs. 89,000 exclusive of HRA. He pays Rs. 450 p.m. towards P.F., Rs. 1,500 to LIC policy and buys NSC worth Rs. 1,500. Find his income tax due from him.

OR

b) Mr. Dharma earns Rs. 72,000 as a teacher annually (excluding HRA). He contributes Rs. 4,000 in N.S.C., Rs. 800 p.m. towards P.F. and Rs. 5,000 in N.S.S. Find his income tax due.

30. a) A cylindrical vessel of radius 42 cm contains water. Find the rise in the level of water if 10 hemispherical solids of radius 7cm are dropped into it.

OR

b) A water tank is in the shape of an inverted cone of radius 14 m and depth 5 m. It is filled through a cylindrical pipe of radius 30 cm and water flows at the rate of 18 km/hr. Find the time taken to fill the tank.

31. a) Find the sum up to 'n' terms of the G. P.  $4 + 44 + 444 + \dots$

OR

b) Find the least number of terms of the series  $1 + 6 + 6^2 + 6^3 + \dots$  for which  $S_n > 3000$ .



## SECTION - D

Note : Answer all the questions, choosing either (a) or (b) in each question.

4 × 5 = 20

32. a) Simplify :

$$\frac{1}{m^2 + 7m + 12} + \frac{1}{m^2 + 9m + 20} - \frac{2}{m^2 + 8m + 15}$$

OR

b) Simplify :

$$\frac{a^2 - 16}{a^3 - 8} \times \frac{2a^2 - 3a - 2}{2a^2 + 9a + 4} \div \frac{3a^2 - 11a - 4}{a^2 + 2a + 4}$$

33. a) If one of the roots of the equation  $x^2 - px + q = 0$  is three times the other, prove that  $16q = 3p^2$ .

OR

b) Find 'm' in the equation  $3x^2 + (2 + m)x - (4 + 3m) = 0$ , if their sum of roots is equal to their product.

34. a) Resolve into partial fractions :

$$\frac{7x - 1}{6x^2 + 5x + 1}$$

OR

b) Resolve  $\frac{m^2}{(m - 1)^2}$  into partial fractions.

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35. a) Find the G.C.D. of  $x^2 + x - 6$ ,  $x^2 + 2x - 8$ ,  $2x^2 - 5x + 2$ .

OR

b) If the G.C.D. =  $(x - 4)$ , L.C.M. is  $(x - 4)(x + 5)(2x + 1)$ , one of the polynomials is  $x^2 + x - 20$ , find the other polynomial.

**SECTION - E**

*Note:* Answer the question, choosing one of the alternatives (a) or (b).

10

36. a) Draw the graph of  $x^2 + y = 0$  and using this graph solve  $(2 - x)(3 + x) = 0$ .

OR

b) Solve graphically :  $x^2 - 6x + 8 = 0$ .

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