This Question Paper contains 4 Printed Pages]

15E(A)

MATHEMATICS, Paper – I

(English version)

Parts A and B

Time : 2½ Hours] ***[Maximum Marks : 50***

Instructions :

1. *Answer the questions under **Part-A** on a separate answer book.*
2. *Write the answers to the questions under **Part-B** on the question paper itself and attach it to the answer book of **Part-A**.*

Part - A

Time : 2 Hours **Marks : 35**

SECTION - I *(Marks : 5×2=10)*

Note :-

1. Answer **ANY FIVE** questions choosing **at least TWO** from each of the following two Groups, i.e. **A** and **B** .
2. Each question carries **2** marks.

GROUP - A

(Statements and Sets, Functions, Polynomials)

1. Prove that "$\sim(p \Rightarrow q) \equiv p \wedge (\sim q)$".

2. Find the value of $n(A \cap B)$, if $n(A \cup B) = 32$, $n(A) = 21$ and $n(B) = 16$.

3. If function $f: R - \{1\} \to R$ is defined as $f(x) = \frac{x+1}{x-1}$;

then prove that $f(x) + f\left(\frac{1}{x}\right) = 0$, $(x \neq 0)$.

4. State and prove "Remainder theorem".

GROUP - B

(Linear Programming, Real numbers, Progressions)

5. The values of an objective function at (2, 0) and (0, 5) are 15 and 12, then find the objective function.

6. Evaluate :

$$\lim_{x \to a} \frac{x^{3/2} - a^{3/2}}{x - a}.$$

7. Solve the inequation $\left|\frac{2x-1}{5}\right| \leq 5$.

8. Find the 12th term of a G.P., if 8th term is 192 and common ratio is 2.

SECTION - II

(Marks : 4×1=4)

Note :

1. Answer **ANY FOUR** of the following **SIX** questions.
2. Each question carries **1** mark.

9. Define Disjunction.

10. Find $f(1)$, if the function is defined as $f(x) = \frac{2x+1}{2x-1}$, $\left(x \neq \frac{1}{2}\right)$.

11. Find the sum and product of roots of the equation $\sqrt{3}x^2 + 9x + 6\sqrt{3} = 0$.

12. Define the Feasible region.

13. If $a^2 = 0.09$, find a^3.

14. Find the Arithmetic Mean of 3 and 23.

SECTION - III

(Marks : 4×4=16)

Note :-

1. Answer **ANY FOUR** questions, choosing **TWO** from each of the following groups, i.e. **A** and **B**.
2. Each question carries **4** marks.

GROUP - A

(Statements and Sets, Functions, Polynomials)

15. Using elementwise, prove that $A - (B \cup C) = (A - B) \cap (A - C)$.

16. $f(x) = x - 1$, $g(x) = x^2 - 2$, $h(x) = x^3 - 3$, $\forall\ x \in R$ are defined, then prove that $fo(goh) = (fog)oh$.

17. Function f is defined by $f(x) = x + 2$, and its domain is $\{x : 2 \le x \le 5\}$. Find f^{-1} and then find domain and range of f^{-1} also.

18. Factorize $3x^4 - 10x^3 + 5x^2 + 10x - 8$.

GROUP - B

(Linear Programming, Real Numbers, Progressions)

19. A shopkeeper sells not more than 30 shirts of each colour. Atleast twice as many white ones are sold as green ones. If the profit on each of the white be Rs.20/-, and that of green be Rs.25/-, how many of each kind be sold to give him a maximum profit ? (Graph is not necessary).

20. If $y = 3^{1/3} + 3^{-1/3}$, then prove that $3y^3 = 10 + 9y$.

21. Find the sum of n terms of the progression 0.5, 0.55, 0.555, 0.5555, ...

22. If the sum of the first 'n' natural numbers is S_1 and that of their squares S_2 and cubes S_3, show that $9S_2^2 = S_3(1 + 8S_1)$.

SECTION - IV

(Marks : 1×5=5)

(Linear Programming, Quadratic Equations)

Note :-

1. Answer **ANY ONE** question from the following.
2. It carries **5** marks.

23. Solve $x^2 - 3x + 2 = 0$ using the graph of $y = x^2$.

24. Minimise $f = x + y$, subject to constraints

$x + y \geq 6$, $2x + y \geq 8$, $x \geq 0$ and $y \geq 0$.