



K19U 2472



Reg. No. :

Name :

0100693

III Semester B.Sc. Degree (CBCSS-Supplementary)

Examination, November - 2019

(2014-2016 Admissions)

CORE COURSE IN MATHEMATICS

3B 03 MAT : ELEMENTS OF MATHEMATICS- 1

Time : 3 Hours

Max. Marks : 48

SECTION - A

All the first 4 questions are compulsory. They carry 1 mark each.

1. If A is a set with m elements and B is a set with n elements and if $A \cap B = \varnothing$ Then $A \cup B$ has _____ elements.
2. Give the remainder when $f(x)$ is divided by $x-a$
3. State Stern's theorem.
4. The greatest common divisor of -5 and 5 is

SECTION - B

Answer any 8 questions from among the questions 5 to 14. These questions carry 2 marks each.

5. Prove that the union of two disjoint denumerable set is denumerable.
6. Determine the truth value of the following statements
 - a) $5+3=9$ or $6+2=8$
 - b) $1+5=8$ and $2+3=5$
7. Form a polynomial equation of fourth degree with rational coefficients having one root $\sqrt{2} + \sqrt{-3}$.

P.T.O.



8. If α, β, γ are the roots of $2x^3 + 3x^2 - x - 1 = 0$ find the equation whose roots are $\alpha - 1, \beta - 1, \gamma - 1$.
9. If $\alpha, \beta, \gamma, \delta$ are the roots of $ax^4 + 4bx^3 + 6cx^2 + 4dx + e = 0$ find the value of $\sum (\alpha - \beta)^2$.
10. If p, q, r, s are positive show that $x^4 + qx^2 + rx - s = 0$ has one positive one negative and two imaginary roots
11. Find the sum of the trigonometric series $1 - \frac{1}{2} \cos \alpha + \frac{13}{24} \cos 3\alpha + \dots$
12. If $\gcd(a, b) = 1$ prove that $\gcd(a+b, ab) = 1$
13. Prove that there is an infinite number of primes.
14. Find the remainder when 2^{50} is divided by 7.

SECTION - C

Answer any 4 questions from among the questions 15 to 20. These questions carry 4 marks each.

15. State and prove Cantor's theorem.
16. Solve $x^4 - 2x^3 + 4x^2 + 6x - 21 = 0$ given that sum of two of its roots is zero.
17. Solve the reciprocal equation $x^4 + 6x^3 - 5x^2 + 6x + 1 = 0$.
18. Solve the Diophantine equation $172x + 20y = 1000$.
19. Find the remainder when $2^{20} + 3^{30} + 4^{40} + 5^{50} + 6^{60}$ is divided by 7.
20. Using the Sieve of Eratosthenes find all primes not exceeding 60.



SECTION - D

Answer any 2 questions from among the questions 21 to 24. These questions carry 6 marks each.

21. a) Prove that the Q of rational numbers is denumerable.
b) Verify that the proposition $p \vee \neg(p \wedge q)$ is a tautology.
22. If α, β, γ are the roots of $x^3 + qx + r = 0$ find the equation whose roots are $\frac{\beta}{\gamma} + \frac{\gamma}{\beta}, \frac{\gamma}{\alpha} + \frac{\alpha}{\gamma}, \frac{\alpha}{\beta} + \frac{\beta}{\alpha}$.
23. Solve $x^3 + 15x + 8 = 0$ using Cardano's method.
24. If a and b are positive integers prove that $\text{g.c.d}(a, b) \cdot \text{l.c.m}(a, b) = ab$.