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K19U 2472

Reg. No. : ....

Name : ....

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 $A \cap B = \varphi$ 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 devisor 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 $1 - \frac{1}{2}\cos\alpha + \frac{1}{2}\frac{3}{4}\cos 3\alpha + \ldots\ldots$

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 taughtology.

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 g.c.d(a,b)l.c.m(a,b)=ab.
