



8. Search for rational roots of $f(x) = 2x^3 - 5x^2 + 5x - 3 = 0$.
9. Show that $x^5 - 2x^2 + 7 = 0$ has at least two imaginary roots.
10. Transform the equation $x^3 - 6x^2 + 5x + 12 = 0$, into an equation lacking second term.
11. Show that if $x = 1 + 2i$, then $x^2 - 2x + 5 = 0$.
12. Find the modulus and amplitude of $\sqrt{3} - i$.
13. Express $\frac{1+i}{2+3i}$ in the form of $X + iY$.
14. A) The solution of a reciprocal equation of first type depends on that of an reciprocal equation of first type and of _____ degree.
B) The solution of a reciprocal equation of first type and of degree $2m$ depends on that of an equation of degree _____.
15. Find the roots of $2x^3 + 3x^2 - 1 = 0$.
16. A) Write the standard form of a cubic equation.
B) What is reciprocal equation ?

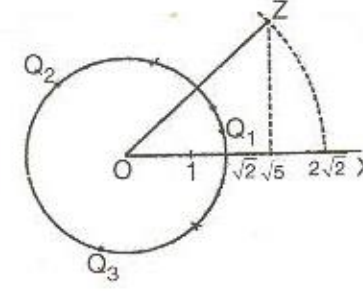
PART- C

Answer **any four** questions from this Part. **Each** question carries **four** marks.

17. Show that the set $E_n = \{2n : n \in \mathbb{N}\}$ of even natural numbers is countably infinite.
18. If α, β, γ are the roots of $x^3 + P_1x^2 + P_2x + P_3 = 0$ then find the equation whose roots are $\alpha^3, \beta^3, \gamma^3$.
19. Find an upper bound and lower bound for the limit to the roots of $f(x) = 3x^4 - 61x^3 + 127x^2 + 220x - 520 = 0$.
20. Solve the reciprocal equation, $x^4 - 8x^3 + 17x^2 - 8x + 1 = 0$.



21. Find the points of Q_1, Q_2, Q_3 representing the values of $\sqrt[3]{z}$ where $z = \sqrt{5} + i\sqrt{3}$.



22. A) Define n^{th} root of unity.
B) Define Principal n^{th} root of unity.
23. Explain the behaviour of roots of the equation $ax^3 + 3bx^2 + 3cx + d = 0$, with respect to discriminant.

PART- D

Answer **any two** questions from this Part. **Each** question carries **six** marks.

24. State and prove Cantor's theorem.
25. i) Find the condition that the sum of two roots of α, β of $x^4 + p_1x^3 + p_2x^2 + p_3x + P_4 = 0$, may be zero.
ii) Use the result to find the roots of the equation, whose roots are the six values of $\frac{1}{2}(\alpha + \beta)$, where α, β are any roots of $ax^4 + 4bx^3 + 6cx^2 + 4dx + e = 0$.
26. If α, β, γ are the roots of $ax^3 + 3bx^2 + 3cx + d = 0$, then find the equation whose roots are squares of the difference of the roots.
27. Define multiplication and division of two complex numbers.



Reg. No.:

Name :

V Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/Improvement) Examination, November 2022
(2019 Admission Onwards)
CORE COURSE IN MATHEMATICS
5B05MAT : Set Theory, Theory of Equations and Complex Numbers

Time : 3 Hours

Max. Marks : 48

PART- A

Answer **any four** questions from this Part. **Each** question carries **one** mark.

1. Give an example of a countable set.
2. Explain Descartes rule of signs.
3. If $f(x) = 0$ is an equation of odd degree, then it has at least one _____ root.
4. Say true or false. "Zero is a complex number".
5. Find the conjugate of $6 - 5i$.

PART- B

Answer **any eight** questions from this Part. **Each** question carries **two** marks.

6. Define a denumerable set, give an example.
7. If α, β, γ are the roots of $2x^3 + x^2 - 2x - 1 = 0$, find
 - i) $\alpha + \beta + \gamma$
 - ii) $\alpha\beta\gamma$
 - iii) $\alpha\beta + \beta\gamma + \alpha\gamma$.