K26FY0349 Pages: 2 Reg No:.....
Name:.....

Fourth Semester FYUGP Degree (Reg) Examination April 2026

KU4DSCMAT202 - NUMBER THEORY AND COMPLEX NUMBERS

2024 Admission onwards

Time : 2 hours Maximum Marks : 70

Section A

Answer any 6 questions. Each carry 3 marks.

1. Define pseudo prime.Give an example.
2. State Wilson's theorem.
3. Write a formula to find the values of n-th root of unity.
4. Determine the principal value of the argument of the complex number $4 + 3i$.
5. Find the polar form of the complex number $z = -5i$.
6. Define Euclidean number.Give an example.
7. Write the canonical form of 4725
8. Show that if $a \equiv b \pmod{n}$, then $b \equiv a \pmod{n}$

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Section B

Answer any 4 questions. Each carry 6 marks.

9. Show that $x^4 + 1 = (x^2 - \sqrt{2}x + 1)(x^2 + \sqrt{2}x + 1)$.
10. State and prove the general form of De Moivre's theorem
11. Convert the complex number $\sqrt{50}(cos\frac{3\pi}{4} + isin\frac{3\pi}{4})$ in to the form $x + iy$.
12. Prove that there is an infinite number of primes.
13. (a) If $a \equiv b \pmod{n}$ and $c \equiv d \pmod{n}$ then verify that $a \equiv c \pmod{n}$
    (b) If $a \equiv b \pmod{n}$ verify that If $a^k \equiv b^k \pmod{n}$ for any positive integer k.
14. Show that 41 divides $2^{20} - 1$.

Section C

Answer any 2 questions. Each carry 14 marks.

15. If a cock is worth 5 coins, a hen 3 coins and 3 chicks together 1 coin, how many cocks, hens and chicks, totaling 100, can be bought for 100 coins?

16. Prove that the linear Diophantine equation $ax + by = c$ has a solution if and only if $d|c$ where $d = \gcd(a, b)$ and if (x_0, y_0) is a particular solution of this equation then all other solutions are given by $x = x_0 + (\frac{b}{d})t$ and $x = y_0 - (\frac{a}{d})t$.

17. (a) State Fermat's theorem.
    (b) Find the unit digit of 3^{100} by the use of Fermat's theorem.

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