

QP CODE: D2BMT2503	(Pages: 2)	Reg. No :
		Name :
SECOND SEMESTER FYUGP EXAMINATION, APRIL 2026 (Regular / Improvement / Supplementary) Discipline Specific Core (DSC) Courses - Major MAT2CJ102 : Elementary Number Theory (Credits: 4)		
Time: 2 Hours	Maximum Marks: 70	
Section A		
Answer the following questions. Each carries 3 marks (Ceiling: 24 marks)		
1. Find $\gcd(-12, 30); \gcd(8, 17); \gcd(-8, -36)$.	BL3	CO1
2. Which of the following Diophantine equations can be solved. (a) $3x + 6y = 18$ (b) $6x + 9y = 21$ (c) $4x + 6y = 15$	BL2	CO2
3. Define pseudoprime numbers and give an example.	BL1	CO3
4. Solve the quadratic congruence $x^2 \equiv 4 \pmod{9}$.	BL3	CO3
5. State the Division Algorithm and use it to find the quotient and remainder when 202 is divided by 13.	BL3	CO1
6. Define $\text{lcm}(a, b)$ where a, b are two nonzero integers. Illustrate it with an example.	BL2	CO1
7. Find the canonical form of prime factorization : 8400 and 27720.	BL5	CO2
8. Verify $89 \mid (2^{44} - 1)$.	BL3	CO3
9. Find the sum of positive integers less than 10 and are relatively prime to 10.	BL3	CO3
10. Find the smallest positive integer congruent to -17 modulo 6.	BL3	CO3
Section B		
Answer the following questions. Each carries 6 marks (Ceiling: 36 Marks)		
11. Find the $\gcd(119, 272)$ and hence express it in the form $119x + 272y$.	BL5	CO1
		(PTO)

12.	Using the Sieve of Eratosthenes, obtain all the primes between 100 and 200.	BL4	CO2
13.	Solve the linear congruence $13x \equiv 8 \pmod{2 \cdot 3 \cdot 7}$ by solving system of linear congruences.	BL3	CO3
14.	Find the remainder when $15!$ is divided by 17.	BL3	CO3
15.	From Fermat's theorem deduce that, for any integer $n \geq 0$, $13 \mid (11^{12n+6} + 1)$.	BL3	CO3
16.	Use Mathematical induction to prove that 8 divides $(5^{2n} + 7)$.	BL3	CO1
17.	Prove that if $p, q_1, q_2, \dots, q_n$ are all primes and $p \mid q_1 q_2 \dots q_n$, then $p = q_k$ for some $k, 1 \leq k \leq n$	BL1	CO2
18.	Solve the linear congruence $140x \equiv 133 \pmod{301}$.	BL3	CO3
Section C			
Answer any one question. Each carries 10 marks (1 x 10 = 10 Marks)			
19.	A customer bought a dozen pieces of fruit, apples and oranges, for \$1.32. If an apple costs 3 cents more than an orange and more apples than oranges were purchased, how many pieces of each kind were bought?	BL5	CO2
20.	State and prove Euler's theorem for congruence modulo n.	BL1	CO3
CO : Course Outcome			
BL : Bloom's Taxonomy Levels (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)			