QP CODE: D2BMT2404	(Pages: 2)	Reg. No : .....
		Name : .....

SECOND SEMESTER FYUGP EXAMINATION, APRIL 2025

MAJOR COURSE

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 $gcd(12,-30); gcd(-8,17); gcd(-4,-36)$.	BL3	CO1
2.	Which of the following Diophantine equations cannot be solved. $(a) 7x+5y=19$ $(b) 200x+150y=1700$ $(c) 12x+18y=35$	BL2	CO2
3.	Define pseudoprime numbers to the base a and give two examples.	BL1	CO3
4.	Find the sum of positive integers less than 40 and relatively prime to 40.	BL3	CO3
5.	Find $lcm(3054, 12378)$.	BL3	CO1
6.	State division algorithm. Illustrate an example.	BL2	CO1
7.	Solve the equation $26x+39y=1$ to obtain one integer solution.	BL5	CO2
8.	Use Fermat's theorem to find the remainder when 5^{38} is divided by 11.	BL3	CO3
9.	Arrange 2,3,4,.....21 in pairs a and b that satisfy $ab \equiv 1 (mod\, 23)$.	BL3	CO3
10.	Find the solution of the system $\begin{matrix} 11x+5y \equiv 7 (mod\, 20) \\ 6x+3y \equiv 8 (mod\, 20) \end{matrix}$	BL3	CO3

Section B

Answer the following questions. Each carries 6 marks (Ceiling: 36 Marks)

11.	Use Mathematical induction to prove that $21\ divides\ (4^{n+1}+5^{2n-1})$.	BL3	CO1

(PTO)

12.	List 12 prime numbers p such that $p^2 - 1$ is a composite number. Justify your answer.	BL4	CO2
13.	Solve the linear congruence $34x \equiv 60(mod\, 98)$.	BL3	CO3
14.	Find the last two digits of 3^{431} using Euler's theorem.	BL3	CO3
15.	Prove that for $n > 1$ and a, b, c, d arbitrary integers the following holds: (i) $a \equiv a\,(mod\, n)$ (ii) If $a \equiv b\,(mod\, n)$, then $b \equiv a\,(mod\, n)$. (iii) If $a \equiv b(mod\, n)$ and $c \equiv d\,(mod\, n)$, then $a + c \equiv b + d\,(mod\, n)$ and $ac \equiv bd\,(mod\, n)$,	BL1	CO3
16.	Find the gcd(24,138) and hence express it in the form 24x + 138y.	BL5	CO1
17.	Prove that the number $\sqrt{2}$ is irrational.	BL4	CO2
18.	Prove that the integer $111^{333} + 333^{111}$ is divisible by 7.	BL3	CO3
	Section C		
	Answer any one question. Each carries 10 marks (1 x 10 = 10 Marks)		
19.	Prove that there is an infinite number of primes.	BL1	CO2
20.	Prove that $\phi(n + 2) = \phi(n) + 2$ for $n = 12, 14, 20..$	BL4	CO3
	CO : Course Outcome		
	BL : Bloom's Taxonomy Levels (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)		