Mathematics — Ganita Manjari

Chapter 11 Test 10

The World of Algorithms

Class IX | 2026–27

Time Allowed: 45 Minutes | Maximum Marks: 25

General Instructions

1. All 13 questions are compulsory. Choose one option in A; show working in B–D.
2. No calculators. Give exact answers unless an approximation is requested.
3. Unless stated otherwise, inputs are positive integers. Give precise algorithm steps.

SECTION A

(5 questions × 1 mark = 5 marks)

1. If $gcd(m, n) = m$ for positive inputs, which statement must hold?

(A) m divides n (B) $n = 0$

(C) $m > n$ (D) $m + n = 1$

2. For positive integers k, n, how many remainder reductions take (kn, n) to a pair with second entry zero?

(A) 0 (B) 1

(C) k (D) n

3. If two positive integers are coprime, their LCM is:

(A) 1 (B) Their sum

(C) Their difference (D) Their product

4. Which change is guaranteed to preserve a GCD?

(A) Adding 1 to both inputs

(B) Doubling only one input

(C) Swapping the two inputs

(D) Deleting one input

5. If $gcd(m, n) = 10$, which is the complete list of their positive common divisors?

(A) [1, 10] (B) [1, 2, 5, 10]

(C) [2, 5] (D) [1, 2, 3, 5, 10]

SECTION B

(4 questions × 2 marks = 8 marks)

6. Given $gcd(m, n) = 7$, determine $gcd(10m, 10n)$ and justify using prime factorisations.

7. A division chain has $u = 3v + 5$ and $v = 2 \times 5 + 1$. Find u, v and then their GCD.

8. A number m is replaced by $m + 4n$, while n is unchanged. Explain why the GCD stays the same.

9. The GCD of two measurements, 60 and 84, is stored as 12. A third measurement, 70, is added. Find the new common GCD without recomputing the first pair.

SECTION C

(3 questions × 3 marks = 9 marks)

10. Determine all possible positive common divisors of two consecutive positive integers n and $n + 1$. Give a proof and explain the resulting GCD shortcut.

11. Use prime exponents to justify $gcd(m, n) \times lcm(m, n) = mn$ for positive integers.

12. Two positive integers have GCD 6 and LCM 180. One is 30. Find the other and verify both conditions.

SECTION D

(1 application question × 3 marks = 3 marks)

13. Two containers hold 154 mL and 238 mL. Measuring out full cups of the same whole-number capacity leaves exactly 4 mL and 13 mL, respectively. Find the greatest possible cup capacity and verify both leftovers.