CSC 203: Discrete Structures – 60 Practice Questions

Section 1: Propositional Logic

1. Which of the following is a proposition?

A. "x + 2 = 10"

B. "The capital of Nigeria is Abuja."

C. "Close the window."

D. "Is it raining?"

Answer: B

2. The truth value of (p ∧ q) is True only when:

A. p is True and q is False

B. Both p and q are True

C. At least one is True

D. Both are False

Answer: B

3. The negation of "It is sunny and hot" is:

A. It is not sunny and not hot

B. It is not sunny or it is not hot

C. It is raining and cold

D. It is sunny but not hot

Answer: B

4. An implication p → q is False ONLY when:

A. p is True, q is True

B. p is False, q is True

C. p is True, q is False

D. p is False, q is False

Answer: C

5. A compound proposition that is always True is called a:

A. Contradiction

B. Contingency

C. Tautology

D. Paradox

Answer: C

Section 2: Predicate Logic

1. The symbol ∀ represents the:

A. Existential Quantifier

B. Universal Quantifier

C. Logical Negation

D. Unique Quantifier

Answer: B

2. "There exists an x such that P(x) is true" is represented by:

A. ∀ x P(x)

B. ∃ x P(x)

C. ¬P(x)

D. P(x) → x

Answer: B
3. What is the negation of ∀x P(x)?
A. ∀x ¬P(x)
B. ∃x ¬P(x)
C. ∃x P(x)
D. ¬∃x P(x)
Answer: B
4. In the predicate "P(x): x is prime", the x is a:
A. Constant
B. Quantifier
C. Variable
D. Logical operator
Answer: C
5. The statement ∃x ∀y P(x,y) means:
A. For every y, there is an x such that P(x,y)
B. There is an x such that for all y, P(x,y)
C. For all x and all y, P(x,y)
D. There exist x and y such that P(x,y)
Answer: B
Section 3: Sets
1. A set with no elements is called:
A. Unit set
B. Empty set (∅)
C. Finite set
D. Infinite set
Answer: B
2. The set of all subsets of A is called the:
A. Universal Set
B. Power Set
C. Complement Set
D. Intersection Set
Answer: B
3. If Set A = {1, 2} and B = {2, 3}, what is A ∩ B?
A. {1, 2, 3}
B. {2}
C. {1, 3}
D. {∅}
Answer: B
4. The number of elements in the power set of a set with 3 elements is:
A. 3
B. 6
C. 8
D. 9
Answer: C ($2^3 = 8$)

5. Two sets are disjoint if their intersection is:
A. The Universal set
B. The Empty set
C. Both sets combined
D. Equal to one another
Answer: B
Section 4: Functions
1. A function f: A $\rightarrow$ B is "Injective" if:
A. Every element in B is reached
B. Distinct elements in A map to distinct elements in B
C. It has a constant value
D. It is a many-to-one mapping
Answer: B
2. A bijective function is one that is:
A. Only Injective
B. Only Surjective
C. Both Injective and Surjective
D. Neither
Answer: C
3. If $f(x) = 2x$ and $g(x) = x + 1$, find $(g \circ f)(x)$:
A. $2x + 1$
B. $2(x + 1)$
C. $2x + 2$
D. $x + 2$
Answer: A
4. The set of all actual output values of a function is the:
A. Domain
/ B. Codomain
C. Range
D. Relation
Answer: C
5. A function has an inverse if and only if it is:
A. Surjective
B. Injective
C. Bijective
D. Linear
Answer: C
Section 5: Sequences and Summation
1. An arithmetic sequence is defined by:
A. A common ratio
B. A common difference
C. Random terms
D. Squaring each term
Answer: B

2. What is the 5th term of the sequence 2, 4, 8, 16, ...?
A. 20
B. 32
C. 64
D. 30
Answer: B
3. The symbol Σ (Sigma) represents:
A. Product
B. Summation
C. Difference
D. Division
Answer: B
4. The sum of the first n positive integers is:
A. n^2
B. n(n+1)/2
C. n(n-1)
D. 2n
Answer: B
5. A sequence defined by its previous terms is called a:
A. Fixed sequence
B. Recursive sequence
C. Constant sequence
D. Divergent sequence
Answer: B
Section 6: Proof Techniques
1. Which proof assumes the negation of the conclusion to reach a contradiction?
A. Direct Proof
B. Proof by Contrapositive
C. Proof by Contradiction
D. Mathematical Induction
Answer: C
2. To prove "If p, then q" by contrapositive, we prove:
A. If q, then p
B. If ¬q, then ¬p
C. If ¬p, then ¬q
D. p and ¬q
Answer: B
3. A "Direct Proof" uses:
A. Counterexamples
B. Logical deductions from axioms/premises
C. Assumptions of falsehood
D. List of all possible cases
Answer: B
4. Disproving a universal statement often requires just one:

A. Theorem
B. Axiom
C. Counterexample
D. Corollary
Answer: C
5. Proving a statement for all possible cases individually is:
A. Exhaustive Proof
B. Vacuous Proof
C. Indirect Proof
D. Trivial Proof
Answer: A
Section 7: Mathematical Induction
1. The first step of an induction proof is the:
A. Inductive Step
B. Base Case
C. Conclusion
D. Hypothesis
Answer: B
2. In the Inductive Step, we assume P(k) is true to prove:
A. P(1)
B. P(k-1)
C. P(k+1)
D. P(n) for all n
Answer: C
3. Mathematical Induction is used for statements over the set of:
A. Real numbers
B. Positive Integers
C. Complex numbers
D. Negative numbers only
Answer: B
4. "Strong Induction" involves assuming P(i) is true for:
A. Only i = 1
B. Only i = k
C. All i from base case to k
D. i = k + 1
Answer: C
5. If the base case fails, the inductive proof is:
A. Still valid
B. Invalid
C. Partially true
D. A contradiction
Answer: B
Section 8: Inclusion-Exclusion & Pigeonhole Principles
1. For two sets A and B, $|A \cup B|$ = :

A. |A| + |B|
B. |A| + |B| - |A ∩ B|
C. |A| * |B|
D. |A| - |B|
Answer: B
2. The Pigeonhole Principle states if n pigeons are in m holes and n > m:
A. At least one hole is empty
B. At least one hole has >1 pigeon
C. Every hole has exactly one pigeon
D. Holes are irrelevant
Answer: B
3. How many people ensure at least two share the same birth month?
A. 12
B. 13
C. 24
D. 31
Answer: B
4. In Inclusion-Exclusion for 3 sets, we ______ the triple intersection.
A. Subtract once
B. Add once
C. Ignore
D. Subtract twice
Answer: B
5. The principle used to avoid overcounting is:
A. Pigeonhole Principle
B. Inclusion-Exclusion Principle
C. Multiplication Principle
D. Division Principle
Answer: B
Section 9: Permutations and Combinations
1. Which formula is used when the order of selection matters?
A. Combination
B. Permutation
C. Addition
D. Binomial
Answer: B
2. The number of ways to arrange 3 books on a shelf is:
A. 3
B. 6
C. 9
D. 1
Answer: B (3! = 6)
3. To choose a team of 2 from 4 people where roles don't matter, use:
A. P(4, 2)

B. C(4, 2)
C. 4^2
D. 2^4
Answer: B
4. The value of 0! is defined as:
A. 0
B. 1
C. Undefined
D. Infinity
Answer: B
5. C(n, r) is equal to:
A. n! / r!
B. n! / (n-r)!
C. n! / [r! (n-r)!]
D. (n-r)! / r!
Answer: C
Section 10: The Binomial Theorem
1. The coefficient of x^k in (1+x)^n is:
A. n!
B. C(n, k)
C. P(n, k)
D. k!
Answer: B
2. The expansion of $(a + b)^2$ is:
A. $a^2 + b^2$
B. $a^2 + 2ab + b^2$
C. $a^2 - 2ab + b^2$
D. 2a + 2b
Answer: B
3. How many terms are in the expansion of (x + y)^n?
A. n
B. n - 1
C. n + 1
D. 2n
Answer: C
4. The sum of all binomial coefficients for a power n is:
A. n^2
B. 2n
C. 2^n
D. n!
Answer: C
5. Pascal's Triangle is a geometric arrangement for:
A. Prime numbers
B. Binomial coefficients

C. Set intersections
D. Logical gates
Answer: B
Section 11: Discrete Probability
1. The set of all possible outcomes is the:
A. Event
B. Sample Space
C. Probability
D. Subset
Answer: B
2. Probability of an event E is P(E) = :
A. |S| / |E|
B. |E| / |S|
C. |E| * |S|
D. 1 - |E|
Answer: B
3. The probability of a "Sure Event" is:
A. 0
B. 0.5
C. 1
D. 100
Answer: C
4. If P(A) = 0.3, what is P(¬A)?
A. 0.3
B. 0.7
C. 0.1
D. 0
Answer: B
5. The probability of rolling a 6 on a fair die is:
A. 1/2
B. 1/6
C. 1/4
D. 1
Answer: B
Section 12: Recurrence Relations
1. A recurrence relation defines a sequence based on:
A. Future terms
B. Previous terms
C. Fixed constants only
D. External variables
Answer: B
2. The recurrence a_n = a_{n-1} + a_{n-2} defines the:
A. Arithmetic progression
B. Fibonacci sequence

C. Geometric progression
D. Harmonic sequence
Answer: B
3. The "Master Theorem" is used to solve recurrences in:
A. Set Theory
B. Algorithm Analysis (Divide-and-Conquer)
C. Probability Theory
D. Logic circuits
Answer: B
4. A first-order linear recurrence depends on:
A. Two previous terms
B. One previous term
C. The first term only
D. The sum of all terms
Answer: B
5. The general solution to a_n = r a_{n-1} is:
A. a_n = r^n * a_0
B. a_n = n * r
C. a_n = a_0 + n*r
D. a_n = r / a_0
Answer: A