Unit 3: Mathematical logic

1. The proposition $(P \rightarrow Q) \wedge (Q \rightarrow P)$ is a
   a) Tautology
   b) Contradiction
   c) Contingency
   d) Absurdity
2. Table used to show the possible combination of inputs for an output is said to be
   a) Logic table
   b) Gate table
   c) System circuit table
   d) Truth table
3. The statement $(\sim P) \rightarrow (\sim Q)$ is logically equivalent to which of the statements below?
   I. $P \rightarrow Q$
   II. $Q \rightarrow P$
   III. $(\sim Q) \vee P$
   IV. $(\sim P) \vee ?Q$
   a) i only
   b) ii and iv only
   c) ii only
   d) ii and iii only
4. let p, q, r denotes the statements "It is raining", "It is cold", and "It is pleasant", respectively. Then the statement "It is not raining, and it is pleasant, and it is not pleasent only if it is raining and it is cold" it is represented by
   a) $(\sim p \wedge r) \wedge (\sim r \rightarrow (p \wedge q))$
   b) $(\sim p \wedge r) \wedge ((p \wedge q) \rightarrow \sim r)$
   c) $(\sim p \wedge r) \vee ((p \wedge q) \rightarrow \sim r)$
   d) $(\sim p \wedge r) \vee (r \rightarrow (p \wedge q))$
5. Which of the following pair of propositions are not logically equivalent?
   a) $((p \rightarrow r) \wedge (q \rightarrow r))$ and $((p \vee q) \rightarrow r)$
   b) $p \leftrightarrow q$ and $(\sim p \leftrightarrow \sim q)$
   c) $(p \rightarrow q) \wedge (q \rightarrow p)$ and $p \leftrightarrow q$
   d) $((p \wedge q) \rightarrow r)$ and $((p \rightarrow r) \wedge (q \rightarrow r))$
6. Which of the following expression is not a tautology?
   a) $((a \rightarrow b) \wedge (b \rightarrow c)) \rightarrow (a \rightarrow c)$
   b) $(a \leftrightarrow c) \rightarrow (\sim b \rightarrow (a \wedge c))$
   c) $(a \wedge b \wedge c) \rightarrow (c \vee a)$
   d) $a \rightarrow (b \rightarrow a)$
7. let p, q, and r be propositions and the expression $(p \rightarrow q) \rightarrow r$ be a contradiction. Then the expression $(r \rightarrow p) \rightarrow q$ is

a) a tautology
b) a contradiction
c) always true when p is false
d) always true when q is true

8. which of the following proposition is tautology?
a) $(p \vee q) \rightarrow q$
b) $P \vee (q \rightarrow p)$
c) $P \vee (p \rightarrow q)$
d) Both (b) and (c)

9. Which of the proposition is $p \wedge (\sim p \vee q)$ is
a) A tautology
b) A contradiction
c) Logically equivalent to $p \wedge q$
d) All of above

10. Which of the following is/are tautology?
a) $a \vee b \rightarrow b \wedge c$
b) $a \wedge b \rightarrow b \vee c$
c) $a \vee b \rightarrow (b \rightarrow c)$
d) none of these

11. $P \rightarrow (Q \rightarrow R)$ is equivalent to
a) $(P \wedge Q) \rightarrow R$
b) $(P \vee Q) \rightarrow R$
c) $(P \vee Q) \rightarrow \sim R$
d) None of these

12. Which of the following are tautologies?
a) $((P \vee Q) \wedge Q) \leftrightarrow Q$
b) $((P \vee Q) \wedge \sim P) \leftrightarrow Q$
c) $((P \vee Q) \wedge P) \leftrightarrow P$
d) Both (a) and (b)

13. Which one of the following is NOT equivalent to $p \leftrightarrow q$?
a) $(\sim p \vee q) \wedge (p \vee \sim q)$
b) $(\sim p \vee q) \wedge (q \rightarrow p)$
c) $(\sim p \wedge q) \vee (p \wedge \sim q)$
d) $(\sim p \wedge \sim q) \vee (p \wedge q)$

14. What is said to be a declarative sentence?
a) Statement
b) Value
c) Operator
d) None of the above

15. Which statement involves only one statement?
a) Simple
b) Compound
c) Composite

d) Logical

16. Which statement involves only one statement?
    a) Simple
    b) Compound
    c) Composite
    d) (b) and (c)

17. The function ((p ∨ (r ∨ q)) ∧ ~(~q ∧ ~r) is equal to the function
    a) q ∨ r
    b) ((p ∨ r) ∨ q)) ∧ (p ∨ r)
    c) (p ∧ q) ∨ (p ∧ r)
    d) (p ∨ q) ∧ ~(p ∨ r)

18. The truth table for (p ∨ q) ∨ (p ∧ r) is the same as the truth table for
    a) (p ∨ q) ∧ (p ∨ r)
    b) (p ∨ q) ∧ r
    c) (p ∨ q) ∧ (p ∧ r)
    d) p ∨ q

19. The Boolean function [~(~p∧q)∧~(~p∧~q)]∨(p∧r) is equal to the Boolean function
    a) q
    b) p ∧ r
    c) r
    d) p

20. Consider the statement, "Either $-2 \leq x \leq -1$ or $1 \leq x \leq 2$." The negation of this statement is
    a) $x < -2$ or $2 < x$ or $-1 < x < 1$
    b) $x < -2$ or $2 < x$
    c) $-1 < x < 1$
    e) $-2 < x < 2$

21. Complete the truth table

p	q	P → q
T	T	T
T	F	----
F	T	----
F	F	----

    a) F,T,F
    b) F,F,T
    c) T,T,F
    d) T,F,T

22. What is the inverse of q→ p ?
    a) ~p → ~q
    b) q → p

c) p → q
d) ~q → ~p

23. The symbolization for a conjunction is...
a) P → q
b) P ^ q
c) P v q
d) ~p

24. In a disjunction, even if one of the statements is false, the whole disjunction is still...
a) False
b) Negated
c) True
d) Both true and false

25. In a conditional statement, the first part is the antecedent and the second part is the...
a) Predicate
b) Consequent
c) Subject
d) Disjunct

26. In a truth table for a two-variable argument, the first guide column has the following truth values:
a) T,T,F,F
b) F,F,T,T
c) T,F,T,F
d) T,F,F,F

27. The four logical connectives are
a) Conjunctions, Conditionals, Compounds, Disjunctions
b) Conjunctions, Statements, Disjuncts, Conditionals
c) Conditionals, Disjunctions , Negations, Conjunctions
d) Conjuncts, Disjuncts, Conditionals, Negations

28. A conditional is symbolized like this
a) P V q
b) P → q
c) P * q
d) P & q

29. A conditional is false only when the antecedent is…
a) True and the consequent is false
b) False and the consequent is false
c) True and the consequent is true
d) False and the consequent is true