INSTITUTE FOR EXCELLENCE IN HIGHER EDUCATION, BHOPAL (M.P.)

DEPARTMENT OF MATHEMATICS

MATHEMATICAL LOGICS

WORKSHOP ON QUESTION BANK

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The aim of conducting this workshop is to provide students a proper knowledge and skill development by providing question bank.

Course Outcomes

Eligibility – BSc. (Mathematics)

- Remembering the statements, logic, sets and their operations.
- Understanding the principles of logic to distinguish between sound and unsound resoning in discourse of everybody.
- Applying the appropriate set theoretic concepts, thinking process, tools and techniques in the solution to various conceptual or real-world problems.
- Analyzing the logical structure of statements symbolically, including the proper use of logical connectives, predicates, and quantifiers.
- Evaluating the problems and write proofs by using the formal language. Using the methods of truth tables also.
- Creating the truth tables for logical expressions and represent Mathematical statements inthe predicate language.

Institute for Excellence in Higher Education, Bhopal (M.P.)

Department of Mathematics

B.Sc. II Year (SEM-III)

Questions Bank

on

MATHEMATICAL LOGICS

(SEC/Vocational)

Multiple Choice Type Questions

Q.1 If A is any statement, then which of the following is a tautology?
a) A ∧ F
b) A ∨ F
c) A ∨ ¬A
d) A ∧ T

2. If A is any statement, then which of the following is not a contradiction?
a) A ∧ ¬A
b) A ∨ F
c) A ∧ F
d) None of mentioned

3. A compound proposition that is neither a tautology nor a contradiction is called a _____
a) Contingency
b) Equivalence
c) Condition
d) Inference

4. ¬ (A ∨ q) ∧ (A ∧ q) is a _____
a) Tautology
b) Contradiction
c) Contingency
d) None of the mentioned

5.A → (A ∨ q) is a _____
a) Tautology
b) Contradiction
c) Contingency
d) None of the mentioned

6.Let P and Q be statements, then P<->Q is logically equivalent to _____
a) P<->~Q
b) ~P<->Q

c) ~P<->~Q
d) None of the mentioned

7. What is the negation of the statement A→(B v C) ?
a) A ∧ ~B ∧ ~C
b) A->B->C
c) ~A ∧ B v C
d) None of the mentioned

8. The statement which is logically equivalent to A ∧ B is?
a) A→B
b) ~A ∧ ~ B
c) A ∧ ~B
d) ~(A→~B)

9. Let P: We give a nice overall squad performance, Q: We will win the match.
Then the symbolic form of "We will win the match if and only if we give a nice overall squad performance." is?
a) P v Q
b) Q ∧ P
c) Q<->P
d) ~P v Q

10. Let P, Q, R be true, false true, respectively, which of the following is true?
a) P∧Q∧R
b) P∧~Q∧~R
c) Q→(P∧R)
d) P→(Q∧R)

11.Match will be played only if it is not a humid day." The negation of this statement is?
a) Match will be played but it is a humid day
b) Match will be played or it is a humid day
c) All of the mentioned statement are correct
d) None of the mentioned

12.Consider the following statements.
A: Raju should exercise.
B: Raju is not a decent table tennis player.
C: Raju wants to play good table tennis.
The symbolic form of "Raju is not a decent table tennis player and if he wants to play good table tennis then he should exercise." is?
a) A→B→C
b) B∧(C→A)
c) C→B∧A
d) B↔A∧C

13.The statement (~P↔Q) ∧(~Q) is true when?
a) P: True Q: False
b) P: True Q: True
c) P: False Q: True
d) P: False Q: False

14. Let P, Q, R be true, false, false, respectively, which of the following is true?
a) P∧(Q∧~R)
b) (P→Q)∧(~R)
c) Q↔(P∧R)
d) P↔(QvR)

15.The contrapositive of p → q is the proposition of _____
a) ¬p → ¬q
b) ¬q → ¬p
c) q → p
d) ¬q → p

16.The inverse of p → q is the proposition of _____
a) ¬p → ¬q
b) ¬q → ¬p
c) q → p
d) ¬q → p

17. The converse of p → q is the proposition of _____
a) ¬p → ¬q
b) ¬q → ¬p
c) q → p
d) ¬q → p

18.What is the contrapositive of the conditional statement? “The home team misses whenever it is drizzling?”
a) If it is drizzling, then home team misses
b) If the home team misses, then it is drizzling
c) If it is not drizzling, then the home team does not misses
d) If the home team wins, then it is not drizzling

19. What is the converse of the conditional statement “If it ices today, I will play ice hockey tomorrow.”
a) “I will play ice hockey tomorrow only if it ices today.”
b) “If I do not play ice hockey tomorrow, then it will not have iced today.”
c) “If it does not ice today, then I will not play ice hockey tomorrow.”
d) “I will not play ice hockey tomorrow only if it ices today.”

20.What are the contrapositive of the conditional statement “I come to class whenever there is going to be a test.”
a) “If I come to class, then there will be a test.”
b) “If I do not come to class, then there will not be a test.”
c) “If there is not going to be a test, then I don’t come to class.”
d) “If there is going to be a test, then I don’t come to class.”

21. What are the inverse of the conditional statement “ A positive integer is a composite only if it has divisors other than 1 and itself.”
a) “A positive integer is a composite if it has divisors other than 1 and itself.”
b) “If a positive integer has no divisors other than 1 and itself, then it is not composite.”

c) “If a positive integer is not composite, then it has no divisors other than 1 and itself.”
d) None of the mentioned

22.What are the converse of the conditional statement “When Raj stay up late, it is necessary that Raj sleep until noon.”
a) “If Raj stay up late, then Raj sleep until noon.”
b) “If Raj does not stay up late, then Raj does not sleep until noon.”
c) “If Raj does not sleep until noon, then Raj does not stay up late.”
d) “If Raj sleep until noon, then Raj stay up late.”

23. What are the contrapositive of the conditional statement “Medha will find a decent job when she labour hard.”?
a) “If Medha labour hard, then she will find a decent job.”
b) “If Medha will not find a decent job, then she not labour hard.”
c) “If Medha will find a decent job, then she labour hard.”
d) “If Medha not labour hard, then she will not find a decent job.”

24.What are the inverse of the conditional statement “If you make your notes, it will be a convenient in exams.”
a) “If you make notes, then it will be a convenient in exams.”
b) “If you do not make notes, then it will not be a convenient in exams.”
c) “If it will not be a convenient in exams, then you did not make your notes.”
d) “If it will be a convenient in exams, then you make your notes

25.Which of the following statements is the negation of the statements “4 is odd or -9 is positive”?
a) 4 is even or -9 is not negative
b) 4 is odd or -9 is not negative
c) 4 is even and -9 is negative
d) 4 is odd and -9 is not negative

26. Which of the following represents: ~A (negation of A) if A stands for “I like badminton but hate maths”?
a) I hate badminton and maths
b) I do not like badminton or maths
c) I dislike badminton but love maths
d) I hate badminton or like maths

27. Which of the following is De-Morgan’s law?
a) $P \wedge (Q \vee R) \equiv (P \wedge Q) \vee (P \wedge R)$
b) $\sim(P \wedge R) \equiv \sim P \vee \sim R$, $\sim(P \vee R) \equiv \sim P \wedge \sim R$
c) $P \vee \sim P \equiv$ True, $P \wedge \sim P \equiv$ False
d) None of the mentioned

28. $\sim A \vee \sim B$ is logically equivalent to?
a) $\sim A \rightarrow \sim B$
b) $\sim A \wedge \sim B$
c) $A \rightarrow \sim B$
d) $B \vee A$

29. Negation of statement (A ∧ B) → (B ∧ C) is _____
a) (A ∧ B) →(~B ∧ ~C)
b) ~(A ∧ B) v (B v C)
c) ~(A →B) →(~B ∧ C)
d) None of the mentioned

30. What is the dual of (A ∧ B) v (C ∧ D)?
a) (A V B) v (C v D)
b) (A V B) ^ (C v D)
c) (A V B) v (C ∧ D)
d) (A ∧ B) v (C v D)

31.Which of the following satisfies commutative law?
a) ∧
b) v
c) ↔
d) All of the mentioned

32. If the truth value of A v B is true, then truth value of ~A ∧ B can be _____
a) True if A is false
b) False if A is false
c) False if B is true and A is false
d) None of the mentioned

33.If P is always against the testimony of Q, then the compound statement P→(P v ~Q) is a _____
a) Tautology
b) Contradiction
c) Contingency
d) None of the mentioned

34.Express, “The difference of a real number and itself is zero” using required operators.
a) ∀x(x − x! = 0)
b) ∀x(x − x = 0)
c) ∀x∀y(x − y = 0)
d) ∃x(x − x = 0)

35. Use quantifiers and predicates with more than one variable to express, “There is a pupil in this lecture who has taken at least one course in Discrete Maths.”
a) ∃x∃yP (x, y), where P (x, y) is “x has taken y,” the domain for x consists of all pupil in this class, and the domain for y consists of all Discrete Maths lectures
b) ∃x∃yP (x, y), where P (x, y) is “x has taken y,” the domain for x consists of all Discrete Maths lectures, and the domain for y consists of all pupil in this class
c) ∀x∀yP(x, y), where P (x, y) is “x has taken y,” the domain for x consists of all pupil in this class, and the domain for y consists of all Discrete Maths lectures
d) ∃x∀yP(x, y), where P (x, y) is “x has taken y,” the domain for x consists of all pupil in this class, and the domain for y consists of all Discrete Maths lectures

36.Let P (x) denote the statement “x >7.” Which of these have truth value true?
a) P (0)
b) P (4)

c) P (6)
d) P (9)

37. Let P(x) denote the statement “x = x + 7.” What is the truth value of the quantification ∃xP(x), where the domain consists of all real numbers?
a) True
b) False

38. Let R (x) denote the statement “x > 2.” What is the truth value of the quantification ∃xR(x), having domain as real numbers?
a) True
b) False

39. ”Everyone wants to learn cosmology.” This argument may be true for which domains?
a) All students in your cosmology class
b) All the cosmology learning students in the world
c) Both of the mentioned
d) None of the mentioned

40.Let domain of m includes all students, P (m) be the statement “m spends more than 2 hours in playing polo”. Express ∀m ¬P (m) quantification in English.
a) A student is there who spends more than 2 hours in playing polo
b) There is a student who does not spend more than 2 hours in playing polo
c) All students spends more than 2 hours in playing polo
d) No student spends more than 2 hours in playing polo

41. A finite non-empty set of symbols is called……..
a) alphabet
b) string
c) letter
d) language

42.Which of the following is Type 1 language or Type 1 grammar?
(a) Regular grammar/ Regular language

(b) Context Free Grammar / Context Free language

(c) Context Sensitive Grammar / Context Sensitive language
(d) Recursively Enumerable

43.Which of the following is Type 0 language?
(a) Regular grammar/ Regular language

(b) Context Free Grammar / Context Free language

(c) Context Sensitive Grammar / Context Sensitive language
(d) Recursively Enumerable

44.The context free grammar X → XX | aXb | bXa |ε generates __?
(a) Number of a's followed by any number of b's

(b) Unequal number of a's and b's

(c) Equal number of a's and b's

(d) None of these

45.Which of the following language cannot be accepted by a regular expression?

(a) Language of a set of numbers divisible by 4

(b) Language of a set of binary complement

(c) Language of a set of 0n1n

(d) Language of a set of string with odd number of 0

46.Context sensitive grammar (CSL) is also called?
(a) Length increasing grammar

(b) Non contracting Grammar

(c) Type 1 Grammar
(d) All of these

47.Which of the following does not belong to the context free grammer?

a. Terminal symbol
b. Non-terminal symbol
c. Start symbol
d. End symbol

48.A regular grammar is a..... ?

a. Context free grammar
b. Non context free grammar
c. English grammar
d. None of above

49.The context free language are closed under... ?
a. Union
b. Kleene star
c. Concatenation
d. All of above

50.Length of string aabbcbabc is

a. 7 b. 9

c. 3 d. 6

ANSWERS

1.	c	30	b
2.	b	31	d
3.	a	32	a
4.	b	33	a
5.	a	34	b
6.	c	35	a
7.	a	36	d
8.	d	37	b
9.	c	38	a
10.	c	39	c
11.	a	40	d
12.	b	41	a
13.	a	42	c
14.	c	43	d
15.	b	44	c
16.	a	45	c
17.	c	46	d
18.	d	47	d
19.	a	48	a
20.	b	49	d
21.	c	50	b
22.	d		
23.	b		
24.	b		
25.	c		
26	d		
27	b		
28	c		
29	a		