

ShivajiUniversity , Kolhapur

Question Bank For Mar 2022 (Summer) Examination

Subject Code :83941

Subject Name : Discrete Mathematics & Structures

Common subject Code :B.Tech.CBCS Part 2 Semester 3

MCQ Question Bank

1. Which of the following propositions is tautology?
 - A) $(p \vee q) \rightarrow q$
 - B) $p \vee (q \rightarrow p)$
 - C) $p \vee (p \rightarrow q)$
 - D) Both (b) & (c)
2. 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
3. The statement which do not contain any connective are called as,
 - A) Statement formula
 - B) Logical statement
 - C) Atomic statement
 - D) Wellform formula
4. Conjunctive statements is connected by,
 - A) or
 - B) and
 - C) not
 - D) if...then
5. If any of the sentence is true then it is true, otherwise it is false. Then it is,
 - A) Conjunction
 - B) Negation
 - C) Disjunction
 - D) Ex-or
6. It is not well form formula,
 - A) $(P \rightarrow (Q \rightarrow (\sim Q)))$
 - B) $(P \rightarrow (Q \rightarrow \sim Q))$
 - C) $((P \wedge Q) \rightarrow Q)$
 - D) $((P \rightarrow Q) \wedge (Q \rightarrow R)) \leftrightarrow P \rightarrow R$
7. The value of statement is true for all possible combinations is called ,
 - A) Tautology
 - B) Contradiction
 - C) Inverse
 - D) Converse
8. $(\sim P \rightarrow Q) \rightarrow (Q \rightarrow P)$ is,
 - A) F T T T
 - B) T T T T
 - C) T T F T
 - D) T F T T
9. A _____ is an ordered collection of objects.
 - A) Relation
 - B) Function
 - C) Set
 - D) Proposition
10. Power set of empty set has exactly _____ subset.
 - A) One
 - B) Two
 - C) Zero
 - D) Three

11. If p : "I went to my class yesterday" then statement: "It is not the case that, I went to my class yesterday" is,
- A) Negation of p
 - B) Same as p
 - C) None of these
 - D) All of these
12. Which of the following two sets are equal?
- A) $A = \{1, 2\}$ and $B = \{1\}$
 - B) $A = \{1, 2\}$ and $B = \{1, 2, 3\}$
 - C) $A = \{1, 2, 3\}$ and $B = \{2, 1, 3\}$
 - D) $A = \{1, 2, 4\}$ and $B = \{1, 2, 3\}$
13. Two sets are called disjoint if there _____ is the empty set.
- A) Union
 - B) Difference
 - C) Intersection
 - D) Complement
14. The intersection of the sets $\{1, 2, 5\}$ and $\{1, 2, 6\}$ is the set _____
- A) $\{1, 2\}$
 - B) $\{5, 6\}$
 - C) $\{2, 5\}$
 - D) $\{1, 6\}$
15. The complement of the set A is _____
- A) $A - B$
 - B) $U - A$
 - C) $A - U$
 - D) $B - A$
16. The set difference of the set A with null set is _____
- A) A
 - B) Null
 - C) U
 - D) B
17. A graph is a set of points, called?
- A) Nodes
 - B) Edge
 - C) Fields
 - D) Lines
18. Graph consists of a?
- A) non-empty set of vertices
 - B) empty set of vertices
 - C) Both A and B
 - D) None of the above
19. What is Null Graph?
- A) A null graph has no nodes
 - B) null graph has no edges
 - C) null graph has no odd vertex
 - D) null graph has no even vertex
20. A function $f: A \rightarrow B$ is _____ (onto) if the image of f equals its range.
- A) Injective
 - B) Surjective
 - C) Inverse
 - D) not surjective
21. If f and g are onto then the function $(g \circ f)$ is?
- A) one to one
 - B) onto
 - C) one to many.
 - D) Into

22. If f and g are onto then the function $(g \circ f)$ is?
- one to one
 - onto
 - One to many.
 - into
23. When a dice is thrown, what is the probability of any one of the numbers?
- $(1/3)$
 - $(5/6)$
 - $(2/3)$
 - $(1/6)$
24. The vertex which is of 0 degree is called?
- Leaf
 - Root
 - Internal node
 - None of the above
25. Probability theory was invented?
- 1638
 - 1654
 - 1674
 - 1666
26. If a coin is tossed, how many possible outcomes?
- 1
 - 2
 - 3
 - 4
27. A bag contains 5 red balls and some blue balls .If the probability of drawing a blue ball is double that of a red ball, then the number of blue balls in a bag is:
- 5
 - 10
 - 15
 - 20
28. A relation can be represented using a?
- Indirected graph
 - Pie graph
 - Directed graph
 - Line graph
29. A relation R on set A is called _____ if xRy implies yRx .
- Irreflexive
 - Reflexive
 - Anti-Symmetric
 - Symmetric
30. The binary relation $\{(1,1), (2,1), (2,2), (2,3), (2,4), (3,1), (3,2)\}$ on the set $\{1, 2, 3\}$ is _____
- reflective, symmetric and transitive
 - irreflexive, symmetric and transitive
 - neither reflective, nor irreflexive but transitive
 - irreflexive and antisymmetric
31. Which of the following involves distinct values i.e. between any two points?
- Continuous Mathematics
 - Non-Continuous Mathematics
 - Non-Discrete Mathematics
 - Discrete Mathematics
32. A set is an _____ collection of different elements.
- Unordered
 - Ordered
 - unordered and ordered
 - None of the above

33. A set can be written explicitly by listing its elements using?
- $()$
 - $[]$
 - $\{\}$
 - $" "$
34. A set which contains a definite number of elements is called?
- Proper Subset
 - Universal Set
 - Finite Set
 - Unit Set
35. The power set of an empty set is?
- 0
 - 1
 - 2
 - empty set
36. What Z_+ represents?
- the set of all rational numbers
 - the set of all positive integers
 - the set of all whole numbers
 - the set of all real numbers
37. Boolean algebra can be used _____
- For designing of the digital computers
 - In building logic symbols
 - Circuit theory
 - Building algebraic functions
38. If function is both surjective and injective then it is known as?
- Invertible
 - Composition
 - Bijjective
 - associative
39. The number of proper subsets of the set $\{1, 2, 3\}$ is
- 8
 - 7
 - 6
 - 5
40. How many subset of an empty set?
- 0
 - 1
 - 2
 - none f these

Theory Question Bank

- What is meant by Tautology? Without using truth table, show that
- Prove that $(P \rightarrow Q) \wedge (R \rightarrow Q) \Leftrightarrow (P \vee R) \rightarrow Q$
- Show that the statement form is a tautology and the statement for is a contradiction.
- Prove that the following statement is tautology

$$P = [(p \vee q) \wedge (p \vee \sim q) \wedge (\sim p \vee q) \wedge (\sim p \vee \sim q)]$$
- Solve the following - $(p \vee q) \wedge \sim q$
- In Boolean algebra prove the following –
 - Additive identity is unique
 - Multiplicative identity is unique
- Using Boolean algebra prove the following –

$$(a \cdot b) + [(a + b') \cdot b]' = 1$$

8. Let p, q, r be the following statements:

p: I will study discrete mathematics

q: I will watch T.V.

r: I am in a good mood.

Write the following statements in terms of p, q, r and logical connectives.

(1) If I do not study and I watch T.V., then I am in good mood.

(2) If I am in good mood, then I will study or I will watch T.V.

(3) If I am not in good mood, then I will not watch T.V. or I will study.

(4) I will watch T.V. and I will not study if and only if I am in good mood.

9. If A, B, C are three non empty sets then prove the following –

$$A \times (B \cup C) = (A \times B) \cup (A \times C)$$

10. Prove that each of the following statements is a tautology

$$(p \leftrightarrow q) \wedge (q \leftrightarrow r) \rightarrow (p \leftrightarrow r)$$

11. If A, B, C are three non empty sets then prove the following –

$$(A - B) \times C = (A \times C) - (B \times C)$$

12. Explain the basic concept of graph theory

13. Define the following terms (i) Power set (ii) Proper subset (iii) Function

14. Write short note on the following –

i. Binary trees

ii. Spanning trees

15. Prove that following statements are logically equivalent

$$p \wedge (q \vee r) = (p \wedge q) \vee (p \wedge r)$$

16. Prove the following equivalences by proving the equivalences of the dual

$$\neg ((\neg P \vee Q) \wedge (\neg P \vee \neg Q)) \wedge (P \vee Q) \equiv P$$

17. Without constructing the truth table obtain the product-of-sums canonical form of the formula). (

$$\neg P \rightarrow R) \wedge (Q \leftrightarrow P) \text{ Hence find the sum-of products canonical form.}$$

18. Obtain the PDNF and PCNF of $P \vee (\neg P \rightarrow (Q \vee (\neg Q \rightarrow R)))$.

19. Show that $R \rightarrow S$ can be derived from the premises $P \rightarrow (Q \rightarrow S)$, $\neg R \vee P$ & Q

20. Show that the following statements constitute a valid argument.

If there was rain, then traveling was difficult. If they had umbrella, then traveling was not difficult. They had umbrella. Therefore there was no rain.

21. Suppose there are six boys and five girls,

(1) In how many ways can they sit in a row.

(2) In how many ways can they sit in a row, if the boys and girls each sit together.

(3) In how many ways can they sit in a row, if the girls are to sit together and the boy don't sit together.

(4) How many seating arrangements are there with no two girls sitting together.

22. Define Isomorphism of two graphs.

23. Define lattice homomorphism and isomorphism.

24. Write the brief note on (i) Application of trees (ii) Tree Traversal (iii) Graph Terminology

25. Define Hasse diagram With example

26. Draw the Hasse diagram for (i) $P_1 = \{1, 2, 3, 4, 12\}$ and \leq is a relation such that $x \leq y$ if x divides y (ii) Let $S = \{a, b, c\}$ and $\tilde{A} = P(S) = \{\emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}, \{a, b, c\}\}$ Consider the partial order of set inclusion (\subseteq)

27. Define Bipartite Graph with example.
28. Draw the Hasse diagram for $D_{24} = \{1, 2, 3, 4, 6, 8, 12, 24\}$, $D_{30} = \{1, 2, 3, 5, 6, 10, 15, 30\}$, $D_{36} = \{1, 2, 3, 4, 6, 9, 12, 18, 36\}$ considering the partial order divisibility.
29. In a Boolean algebra prove that $(a \wedge b)' = a' \vee b'$
30. Show that in any Boolean algebra, $(a + b')(b + c')(c + a') = (a' + b)(b' + c)(c' + a)$
31. Get the contra positive of the statement "If it is raining then I get wet"
32. Show that the propositions $p \rightarrow q$ and $\neg p \vee q$ are logically equivalent.
33. Show that $p \rightarrow (q \rightarrow r) \Leftrightarrow (p \wedge q) \rightarrow r$ without using truth tables.
34. write the negation of the statement "If there is a will, then there is a way"
35. Prove that $(p \rightarrow q) \Leftrightarrow (p \wedge q) \vee (\neg p \wedge \neg q)$
36. A fair coin tossed three times. What is the probability to get at least one head in three tosses.
37. Define the following terms (i) onto function (ii) one-one function (iii) Bijective function
38. Check whether $((p \rightarrow q) \rightarrow r) \vee \neg p$ is a tautology.
39. Define the following terms (i) Reflexive relation (ii) Symmetric relation (iii) Transitive relation
40. Obtain the PDNF and PCNF of $p \vee (\neg p \rightarrow (q \vee (\neg q \rightarrow r)))$
41. Show that the hypotheses, "It is not sunny this afternoon and it is colder than yesterday," "We will go swimming only if it is sunny," "If we do not go swimming then we will take a canoe trip," and "If we take a canoe trip, then we will be home by sunset" lead to the conclusion "we will be home by sunset".
42. Define the following terms (i) Biconditional (ii) Conjunction (iii) Implication
43. Define the following terms (i) Bipartite graphs (ii) Simple and Complete graphs
44. What are the types of relation
45. Explain different types of functions
46. What is the hasse diagram explain with example
47. Let $A = \{1, 3, 9, 27, 81\}$. Draw the hasse diagram of the poset (A, I)
48. Short note on i) Semi groups ii) Monoids
49. Define and Explain groups with example
50. With example explain types of graph.
51. Short note on i) composition function ii) inverse function.
52. What is lattice? What are the types of lattice?
53. What is subgroup and explain its properties
54. Short note on i) Subgroup ii) Homomorphism.
55. Define and explain types of Normal Form
56. What Are The Types Of Sets?
57. What Are Connectives? explain with example
58. Short note on i) Duality Principle ii) Set Operations
59. Short note on i) PDNF ii) PCNF
60. With example explain Minimization of Boolean Functions