U.G. 3rd Semester Examination - 2020

MATHEMATICS

Course Code : BMTMSERT304

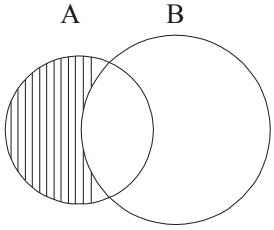
Course Title : Logic and Sets

Full Marks : 50 Time : 2 Hours

The figures in the right-hand margin indicate marks.

Answer all the questions by choosing correct alternative: 2×25=50

1. If A and B are subsets of a set X, then what is $\{A \wedge (x - B)\} \cup B$ equal to?
   a) $A \cup B$ b) $A \cap B$ c) A d) B
2. The inverse of $p \to q$ is the proposition of
   a) $\sim p \to \sim q$ b) $\sim q \to \sim p$ c) $q \to p$ d) $\sim q \to p$
3. The total number of different reflexive relation on a set of 16 elements is
   a) $4^{16^2} - 16$ b) $5^{16^2} - 16$ c) $2^{16^2} - 16$ d) $3^{16^2} - 16$
4. Let $A = \{1,3,5\}, B = \{2,4\}$. Then A×B=
   a) {(1, 2), (1, 4), (3, 2), (3, 4),(5, 2), (4, 5)}
   b) {(2, 1), (2, 3), (2, 5), (4, 1),(4, 3), (4, 5)}
   c) {(1, 2), (1, 4), (3, 2), (3, 4),(5, 2), (5, 4)}
   d) {(1, 2), (1, 4), (3, 2), (4, 3),(5, 2), (4, 5)}
5. A relation R on a set A is called_____ if xRy implies yRx.
   a) Reflexive b) Symmetric c) Transitive d) Antisymmetric
6. For a set A, consider the following statements
   i) $A \cup P(A) = P(A)$ ii) $\{A\} \cup P(A) = P(A)$ iii) $\{A\} \cap P(A) = A$
   Which of the statements given above are correct?
   a) (i) only b) (i) and (ii) c) (ii) and (iii) d) None
7. The truth table for $(p \vee q) \vee (p \wedge r)$ is the same as the truth table for
   a) $(p \vee q) \wedge (p \vee r)$ b) $(p \vee q) \wedge r$ c) $p \vee q$ d) $(p \vee q) \wedge (p \wedge r)$
8. The contrapositive of $p \to q$ is the proposition of
   a) $\sim p \to \sim q$ b) $\sim q \to \sim p$ c) $q \to p$ d) $\sim q \to p$
9. Let A={2, 3, 5, 6}, B={8, 10, 13, 20} and p be a relation defined by p={(2, 8), (2, 10), (3, 10), (5, 10), (5, 20)}then
   a) Image of p ={8, 10, 20} b) Image of p ={2, 5}
   c) Image of p ={2, 8, 10} d) Image of p ={8, 10, 5}
10. In a disjunction, even if one of the statement is false, the whole disjunction is still
    a) False b) Negated c) True d) Both true and false
11. The symbolization for a conjuction is
    a) $p \to q$ b) $p \& q$ c) $p \vee q$ d) ~p
12. The shaded area of figure is best described by



a) $A^{/}$ (complement of A) b) $A \cup B - B$

c) $A \cap B$ d) B

13. If n(A)=20, n(B)=30 and $n(A \cup B) = 40$ then $(A \cap B)$ is

a) 20 b) 30 c) 40 d) 10

14. Let p={(1, 1), (2, 3), (3, 4), (3, 5), (4, 5)} be a relation on a set $A = \{1, 2, 3, 4, 5\}$. Then

a) $p^{-1} = \{(1,1),(3,2),(4,3),(5,3),(4,5)\}$ b) $p^{-1} = \{(3,2),(4,3),(5,3),(4,5)\}$

c) $p^{-1} = \{(1,1),(3,2),(4,3),(3,5),(5,4)\}$ d) $p^{-1} = \{(1,1),(3,2),(4,3),(5,3),(5,4)\}$

15. $p \vee q$ is logically equivalent to

a) $\sim q \rightarrow \sim p$ b) $q \rightarrow p$ c) $\sim p \rightarrow \sim q$ d) $\sim p \rightarrow q$

16. Determine the characteristics of the relation aRb if $a^2=b^2$

a) Transitive and Symmetric b) Reflexive and Symmetric

c) Antisymmetric, reflexive and transitive d) Symmetric, reflexive and transitive.

17. Let, P(x) be the statement "cos x>x". Then what are the truth values of the propositions P(0) and $P\left(\frac{\pi}{2}\right)$ respectively?

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

18. $A \cup B = A \cup C$ and $A \cap B = A \cap C$ then

a) B = C b) A = B = C c) A = C d) A = B

19. How many rational and irrational number are possible between 0 and 1?

a) 0 b) Finite c) Infinite d) 1

20. In a class of 100 students, 55 students have passed in mathematics & physics and 67 students have passed in physics. Then the number of students who have passed in physics only is

a) 22 b) 33 c) 10 d) 12

21. Let S be an infinite set and S_1, S_2, S_3, ..., S_n be sets such that $S_1 \cup S_2 \cup S_3 \cup ...S_n = S$ then

a) Atleast one of the sets S_i is a finite set

b) Not more than one of the set S_i can be finite

c) Atleast one of the sets S_i is an infinite set

d) None of these.

22. Let P be defined on $\mathbb{Z} \times \mathbb{Z}$ by "(a,b)P(c,d) if and only if ad = bc" for (a, b), (c, d) $\in \mathbb{Z} \times \mathbb{Z}$. Then P is

a) reflexive only b) symmetric & reflexive but not transitive

c) not symmetric d) equivalence relation

23. Let, $A = \{(x, y) : y = e^x, x \in \mathbb{R}\}$ and $B = \{(x, y) : y = e^{-x}, x \in \mathbb{Z}\}$ Then

a) $A \cap B = \phi$ b) $A \cap B = \{(0,1)\}$ c) $A \cap B = \mathbb{R}^2$ d) None of these

24. If a set contains 8 elements then the number of subset is–

a) 512 b) 256 c) 128 d) 1024

25. What is the cardinality of the set of odd positive integers less than 10 ?

a) 10 b) 15 c) 3 d) 20

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