

Total No. of Questions : 18

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B.Tech. (CSE/IT) (2018 Batch) (Sem.-4)
DISCRETE MATHEMATICS

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Subject Code : BTCS-401-18

M.Code : 77626

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is **COMPULSORY** consisting of **TEN** questions carrying **TWO** marks each.
2. SECTION-B contains **FIVE** questions carrying **FIVE** marks each and students have to attempt any **FOUR** questions.
3. SECTION-C contains **THREE** questions carrying **TEN** marks each and students have to attempt any **TWO** questions.

SECTION-A

Answer briefly :

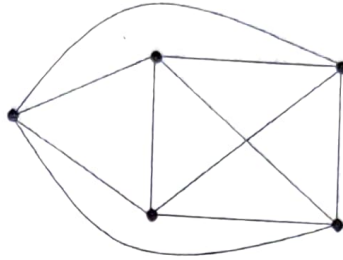
1. Find the Cartesian product $A \times A$ if $A = \{0, 1, 3\}$.
2. Construct the truth table of the compound proposition $(p \vee \neg q) \rightarrow (p \wedge q)$.
3. Define contrapositive of a conditional statement and find the same for the following statement:
"If you do your homework, you will not be punished"
4. What is the power set of the empty set? What is the power set of the set $\{\phi\}$? Here ϕ is an empty set.
5. State pigeonhole principle.
6. Find the greatest common divisor of 414 and 662 using the Euclidean algorithm.
7. Draw a Complete graph with 5 vertices.
8. Does there exist a simple graph with six vertices of degrees 1, 1, 3, 4, 6, 7? Justify.
9. Define a permutation group.
10. For any a, b in a Boolean algebra prove that $(a+b)' = a'+b'$.

SECTION-B

11. Show that $\neg(p \vee (\neg p \wedge q))$ and $\neg p \wedge \neg q$ are logically equivalent by developing a series of logical equivalences.
12. In a survey it was found that 21 people liked product A, 26 liked product B and 29 liked product C. If 14 people liked products A and B, 12 liked products C and A, 14 people liked products B and C and 8 liked all the three products. Find how many liked product C only?
13. Let A be the set of integers and R be the relation defined on $A \times A$ by $(a,b)R(c,d)$ if $ad=bc$. Prove that R is an equivalence relation.
14. Explain the following with suitable examples :
 - a) Connected graph
 - b) Planar graph
 - c) Vertex colouring of a Graph
 - d) Rooted tree
15. Show that the set $G=\{1,2,3,4,5,6\}$ is a finite abelian group of order 6 w.r.t. multiplication modulo 7.

SECTION-C

16.
 - a) Prove that $\sqrt{2}$ is irrational by giving a proof by contradiction.
 - b) Find the number of arrangements of the letters of the word INDEPENDENCE. In how many of these arrangements
 - i) All the vowels always occur together.
 - ii) Vowels never occur together.
17.
 - a) Prove that a finite integral domain is a field.
 - b) Using Boolean algebra, show that :
$$abc+ab'c+abc'+a'bc=ab+bc+ca$$
18. a) Determine whether the following graph is :



- i) Hamiltonian, if yes, find the Hamiltonian cycle.
 - ii) Eulerian, if yes, find the Euler cycle.
- b) Use the well-ordering property to prove the division algorithm which states that if a is an integer and d is a positive integer, then there are unique integers q and r with $0 \leq r < d$ and $a = dq + r$.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.