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Total No. of Questions: 18

B.Tech. (CSE/IT) (2018 Batch) (Sem.-4) DISCRETE MATHEMATICS 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 $(p \lor \neg q) \rightarrow (p \land q)$.
- 3. Define contrapositive of a conditional statement and find the same for of 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 exits 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 $\neg (p \lor (\neg p \land q))$ and $\neg p \land \neg q$ 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×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 $0 \le r < d$ 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.