Reg. No………………………………………. Name…………………………………………… **21U238-S**

B. C. A. DEGREE END SEMESTER EXAMINATION – JULY 2021

SEMESTER - 2: COMPLEMENTARY MATHEMATICS FOR B Sc COMPUTER APPLICATION

COURSE: 16U2CPCMT2: DISCRETE MATHEMATICS

(Common for Supplementary 2018 / 2017 / 2016 Admissions)

Time: Three Hours Maximum Marks: 75

PART A

Answer all questions. Each question carries 1 mark

1. Find the dual of the following compound propositions.
   $(p \wedge \neg q) \vee (q \wedge F)$
2. List the elements of R from A ={0,1,2,3,4} to B ={0,1,2,3} where (a,b) $\in R$ if a + b = 4.
3. Define a finite set and an infinite set.
4. Define a path and the length of a path in a graph.
5. Write the negation of the preposition, p: 2+3 >1.
6. Let *p* be "Ravi is tall" and q be "Ravi is handsome". Write the following statement in symbolic form. "Ravi is short or not handsome".
7. Give an example of a relation that is reflexive and symmetric but not transitive.
8. How many numbers between 5000 and 10,000 can be formed from the digits 1,2,3,4,5,6,7,8,9, each digit not appearing more than once in each number?
9. Determine the truth value of the following statement.
   "If Calcutta is in India, then 1+1 = 3".
10. If there are 12 persons in a party, and if each two of them shake hands with each other, how many handshakes happen in the party? (1 × 10 = 10)

PART B

Answer any eight questions. Each question carries 2 marks.

11. Let R be the relation on the set N of natural numbers defined by
    R = {(a,b) : a + 3b = 12 where a,b ε N}. Find the range of R?
12. Explain Hamming code.
13. How many different words can be made out of the letters in the word ALLAHABAD?
14. Let U = {1,2,3,4,5,6,7,8,9}, A = {1,2,3,4} and B = {2, 4,6,8}. Find (A - B)'.
15. Represent Konigsberg Bridge problem by means of a graph.
16. Let A and B be two sets such that n(A∪ B) = 42, n(A) = 20 and n(A∩B) = 4.
    Find *n*(B).
17. Verify whether the following preposition is a tautology.
    $(p \wedge q) \rightarrow p$.
18. Define binary tree with example.
19. In how many ways can 10 pearls be strung on a bond to form a necklace?
20. State De Morgan's laws in logic. (2 × 8 = 16)

PART C

Answer any five questions. Each question carries 5 marks

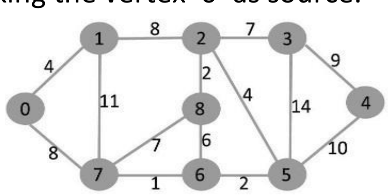
21. State and prove Euler's formula.
22. Prove that $1+ 2 + 2^2 + ... + 2^n = 2^{n+1} - 1$.
23. Define the following graphs with an example.
    (a) Eulerian graph (b) Planar graph
24. If the ratio ${}^{2n}C_3$ **:** ${}^{n}C_3$ = 11**:** 1, find the value of n.
25. Determine whether the following compound preposition is a tautology.
    $(p \leftrightarrow q) \leftrightarrow ((p \wedge q) \vee (\neg p \wedge \neg q))$
26. Let R be a relation on the set N of natural numbers defined by R = {(a,b) / a +3b = 12, $a \in N, b \in N$}. Find (i) the relation R (ii) domain of R (iii) range of R.
27. State and prove Dominance Laws in Boolean Algebra. (5 x 5 = 25)

PART D

Answer any two questions. Each question carries 12 marks

28. (a) Determine whether the following compound preposition is a tautology, using truth table. $(q \rightarrow r) \wedge r \wedge (p \rightarrow q)$. (8 marks)
    (b) State and prove idempotent law in Boolean algebra. (4 marks)
29. (i) Suppose A = {2, 3, 6, 9, 10, 12, 14, 18, 20} and R is the partial order relation defined on A where xRy if and only if x is a divisor of y.
    (a) Draw the Hasse diagram for R.
    (b) Find all maximal elements.
    (c) Find all minimal elements. (6 marks)

    (ii) Let **A** = {1,2,3,4,5,6,7} and **R** be a relation on **A** defined by **R** = {(x,y) / (x-y) is divisible by 3, where x,y ε **A**}.
    (a) Find the relation **R**
    (b) Is **R** an equivalence relation? Explain. (6 marks)
30. Explain Dijkstra's algorithm to find the shortest path. Also apply it on the following graph by taking the vertex '0' as source. (12 marks)



31. Without using truth table prove the following
    $\sim(p \leftrightarrow q) \equiv (p \vee q) \wedge \sim(p \wedge q) \equiv (p \wedge \sim q) \vee (\sim p \wedge q)$ (12 marks)

(12 x 2 = 24)

****