## B. C. A. DEGREE END SEMESTER EXAMINATION – MARCH/APRIL 2018

SEMESTER – 2: BACHELOR OF COMPUTER APPLICATION (COMPLEMENTARY COURSE)

COURSE-**16U2CPCMT2: DISCRETE MATHEMATICS**

(Common for Regular 2017 / Supplementary - Improvement 2016 Admission)

Time: Three Hours   Max. Marks: 75

### PART A
Answer *all* questions. Each question carries **1** mark

1. Define a power set. What is the cardinality of a power set?
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. *Explain the duality* principle in mathematical logic.
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. Give an example of a relation which is reflexive and symmetric but not transitive.
7. Define a connected graph with an example.
8. Write the adjacency matrix of the following graph.
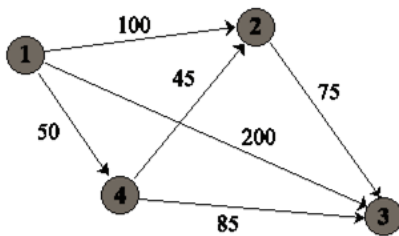
9. Determine the truth value of the statement.
    If Calcutta is in India, then 1+1 = 3.
10. In how many ways can a committee containing 26 members elect a president, treasurer and secretary?   (1 × 10 = 10)

PART B
Answer *any eight* questions. Each question carries **2** marks.

11. How many seven letter words can be formed using the letters of the word BENZENE?
12. How many number of 4 digits can be formed from the digits 4,5,6,7,8,9 when
    (i) no digit is repeated   (ii) digits may be repeated
13. Define union and intersection of two sets. Give their Venn diagram representation.
14. Let f: R → R defined f(x) = $\sqrt{4x - 7}$. Find the inverse of f(x).
15. Prove that p → q and (¬ p ∨ q) are logically equivalent.
16. Let *p* be "It is cold" and *q* be "It is raining". Write the following in symbolic form
    (i) It is raining or it is not cold. (ii) It is cold if and only if it is not raining.
17. Find the Euler path or an Euler circuit, if it exists in the graphs given below.
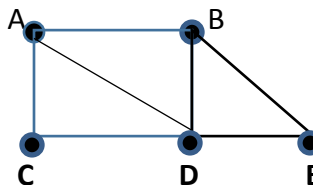
18. Define a planar graph with an example.
19. Define binary tree with example.
20. In how many ways can 10 pearls be strung on a bond to form a necklace?   (2 × 8 = 16)

PART C
### Answer *any five* questions. Each question carries **5** marks

21. For any a, b ∈ B, show that a + a′ **.** b = a + b

22. Explain Konigsberg Bridge Problem. Represent the problem by means of a graph. Does the problem have a solution?

23. State and prove Euler's formula.

24. From a club consisting of 6 men and 7 women, in how many ways can we select a committee of 4 person

    (a)   which has at least one woman   (b)   which has both men and woman.

25. 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**}.
    (i) Find the relation **R**
    (ii) Is **R** an equivalence relation? Explain.

26. Determine whether the following compound preposition is a tautology.

    $$(p \leftrightarrow q) \; \leftrightarrow ((p \wedge q) \vee (\neg p \; \wedge \neg q))$$ (5 × 5 = 25)

PART D
Answer *any two* questions. Each question carries **12** marks

27. (a) Draw the Hasse diagram representing the partial ordering {(a,b)/ a divides b} on
    {2, 3, 4, 5, 6, 8, 10, 40}   (6 marks)

    (b) Prove that that $1^3+2^3+3^3+ \ldots + n^3 = \frac{n^2 (n+1)^2}{4}$.   (6 marks)

28. State and prove De Morgan's law and absorption law in Boolean algebra.   (12 marks)

29. 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)
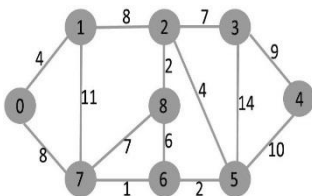
30. (a) How many words can be formed of the letter of the word MALENKOV so that
    (i) no two vowels are together   (ii) the relative position of the vowels and consonants remain unaltered.   (6 marks)
    (b) If 30Pr = 21 × 30P$_{r-1}$. Find the value of r.   (6 marks)
                                                                                 (12 × 2 = 24)

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