



GG-072004

Seat No. \_\_\_\_\_

**B. C. A. (Sem. II) Examination**

March / April – 2019

**BCAOC - 204 : Discrete Mathematics**

Time : 3 Hours]

[Total Marks : 70

**Instructions**

- (1) Figures on the right indicate the marks.
- (2) All Questions are compulsory.
- (3) Answer of each question must start on a new page.
- (4) Answer of all sub-questions of a question should be written in continuous order.

**1 Answer the following: (Any 14)**

14

- (1) Define Big-O notation.
- (2) Prove that if  $A \subset B$ , then  $P(A) \subset P(B)$ .
- (3) Define permutations.
- (4) In how many ways can 7 persons be arranged in a circle?
- (5)  $A = \{a, b, c\}$   $B = \{d, e, f\}$ . Find  $P(A)$  and  $A \times B$ .
- (6) When is  $A - B = B$ ?
- (7) Define relation.
- (8) When is  $A - B = B - A$ ?
- (9) Define walk.
- (10) Define path.
- (11) Define planer graphs
- (12) Define tree
- (13) Explain minimum spanning tree.
- (14) Define tree traversal.
- (15) Define Euler Paths.
- (16) Define combination.

**2 Answer the following: (Any two)**

14

- (1) If  $A = \{1, 5, 9, 13\}$ ,  $B = \{5, 13, 17, 19\}$ ,  $C = \{5, 13, 20, 2\}$  and the universal set  $U = \{1, 2, 3, \dots, 20\}$   
Then show that (1)  $(A \cup B)' = (A' \cap B')$   
(2)  $(A \cup B) \cap (A \cup C) = A \cup (B \cap C)$   
(3)  $B - A = B - (A \cap B)$   
(4)  $(A \cup B) = A \cup [B - (A \cap B)]$
- (2) There were 100 visitors in a library on a particular day. Of them 28 read only daily newspapers, 30 Read monthly magazines, 42 borrowed books, 5 borrowed books and read newspapers, 8 read Newspapers and magazines, 8 borrowed books and read magazines and 3 borrowed books, read Newspapers and magazines. How many persons just come and left without borrowing a book or Reading anything?
- (3) Consider set inclusion relation on a set X. Show that set inclusion relation is reflexive and Transitive.

**3 [A] Answer the following: (Any two)**

14

- (1) How many words can be formed by using all the letters in STATISTICS? How many of them will have I in the first and last place?
- (2) How many permutations are possible with all the letters of the word HEXAGON? In the dictionary Order of these words, which place will this word occupy?
- (3) With the help of principle of mathematical induction show that  $X^{2n} - Y^{2n}$  is divisible by  $X - Y$ . ( $X \neq Y$ ).

**4 Answer the following (Any Two)**

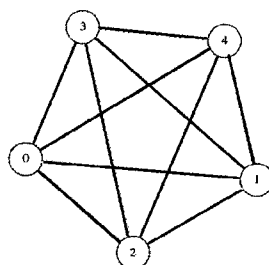
14

- (1) Are following functions one-one? Onto?
  - (a)  $f: \mathbb{N} \rightarrow \mathbb{N}$ ,  $f(x) = 2x - 1$ .
  - (b)  $f: \mathbb{Z} \rightarrow \mathbb{Z}$ ,  $f(n) = (-1)^n$
  - (c) Define one-one function. Define onto function.
- (2) If  $f: \mathbb{R} \rightarrow \mathbb{R}$ ,  $f(x) = x + 1$  and  $g: \mathbb{R} \rightarrow \mathbb{R}$ ,  $g(x) = x - 1$ . Find fog and gof.
- (3)  $A = \{x, y\}$ ,  $B = \{x, y, z\}$ . Find the number of onto functions  $f: A \rightarrow B$ .

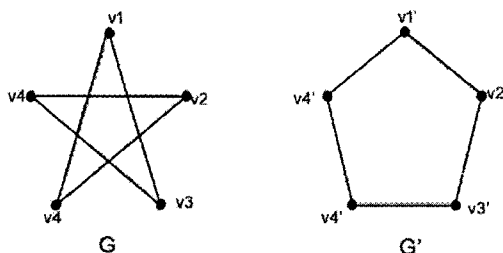
**5 Answer the following (Any Two)**

14

- (1) Define vertex degree in graph. Give an example of a graph on 5 vertex such that each vertex has degree 4. Does there exists a simple graph G on 5 vertices such that G has a vertex of degree 5? Justify your answer.
- (2) Define spanning tree. State Cayley theorem for spanning tree. Find two different spanning trees of the following graph G.



- (3) Define graph isomorphism. Are the following graphs isomorphic to each other?



Is graph G3 isomorphic to G1 and G2?

