**POORNIMA UNIVERSITY, JAIPUR**

**END SEMESTER EXAMINATION, April 2023**

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|  | **1BC2138** | Roll No. | Total Printed Pages: 2 |
| **1BC2138** |  |
| BCA I Year II-Semester (Main/Back) End Semester Examination, April 2023  **(Gen)** | |
| **BCACCA2105 : Discrete Mathematics** | | | |

# Time: **3** Hours. Total Marks: **60**

Min. Passing Marks: **21**

Attempt **five** questions selecting one question from each Unit. There is internal choice from Unit I to Unit V. Marks of each question or its parts are indicated against each question / parts. Draw neat sketches wherever necessary to illustrate the answer. Assume missing data suitably (if any) and clearly indicate the same in the answer.

Use of following supporting material is permitted during examination for this subject.

# **1.--------------------------Nil--------------------** **2.------------------Nil-----------------------**

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|  |  | **UNIT-I (CO1)** | **Marks** |
| **Q.1** | **(a)** | Define Power set. If S be a finite set of order n then prove that P(S) is a finite set of order 2n. | **(6)** |
|  |  |  |  |
|  | **(b)** | Prove by means of truth table that  (i)  (ii)Ʌ{ | **(6)** |
|  |  |  |  |
|  |  | **OR** |  |
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| **Q.2** | **(a)** | Prove by principal of mathematical induction that | **(6)** |
|  |  |  |  |
|  | **(b)** | If A,B and C are three sets, then prove that  (i) (ii) | **(6)** |
|  |  |  |  |
|  |  | **UNIT-II (CO2)** |  |
|  |  |  |  |
| **Q.3** | **(a)** | Prove that (Z7, X7), where Z7 = (1,2,3,4,5,6) and X7 denote multiplication modulo 7 is an abelian group. | **(6)** |
|  |  |  |  |
|  | **(b)** | Find the value of following Boolean function, Also find which two Boolean functions are same:- | **(6)** |
|  |  |  |  |
|  |  | **OR** |  |
|  |  |  |  |
| **Q.4** | **(a)** | Find the generating function for the sequence 0, 2, 6, 12, 20, 30, 42, … | **(6)** |
|  |  |  |  |
|  | **(b)** | How many permutations can be made with letters of the word CONSTITUTION? Also find the number of permutations in which  (i)Two O’s come together (ii) Vowels occur come together  (iii) Consonants and vowels occur alternatively (iv) Two O’s do not come together (v) Letter N occurs both at the beginning and at the end. | **(6)** |
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|  |  | **UNIT-III (CO3)** |  |
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| **Q.5** | **(a)** | Express the Boolean function  in disjunctive normal form. | **(6)** |
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|  | **(b)** | Prove that in a Boolean algebra <**B, +, . , ’ >** for all elements  (a+ b).(b + c).(c + a)=a. b + b. c + c. a | **(6)** |
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|  |  |  |  |
|  |  | **OR** |  |
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| **Q.6** | **(a)** | Show that and are equivalent Boolean expressions. | **(6)** |
|  |  |  |  |
|  | **(b)** | Simplify the Boolean expression in POS term using four variable K-map  F(A,B,C,D)= | **(6)** |
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|  |  | **UNIT-IV (CO4)** |  |
|  |  |  |  |
| **Q.7** | **(a)** | Draw graphs which are  (i) Euler and Hamiltonian both (ii) Euler but not Hamiltonian  (iii) Hamiltonian but not Euler (iv) Neither Euler nor Hamiltonian | **(6)** |
|  |  |  |  |
|  | **(b)** | Prepare the minimum spanning tree for the graph shown in figure by Kruskal’s method: | **(6)** |
|  |  |  |  |
|  |  | **OR** |  |
|  |  |  |  |
| **Q.8** | **(a)** | Prove that the number of edges in a simple graph with n vertices and k (1) connected components cannot exceed (n-k)(n-k+1)/2. | **(6)** |
|  |  |  |  |
|  | **(b)** | Prove that a graph G is connected if and only if it has a spanning tree. | **(6)** |
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|  |  | **UNIT V (CO5)** |  |
|  |  |  |  |
| **Q.9** | **(a)** | Define partially ordered set or poset. Prove that [Z+,divisibility] is a partially ordered set. | **(6)** |
|  |  |  |  |
|  | **(b)** | Show that in the set A={1,2,3},then relation R={(1,1),(2,2),(3,3),(1,2),(2,1),(2,3),(3,2),(3,1),(1,3)} is an equivalence relation. | **(6)** |
|  |  | **OR** |  |
|  |  |  |  |
| **Q.10** | **(a)** | Let X={2 ,3, 6, 12, 24, 36} and the relation be such that if divides . Draw the Hasse diagram of (X,). | **(6)** |
|  |  |  |  |
|  | **(b)** | Answer the following questions concerning the poset ({2,4,6,9,12,18,27,36,48,60,72}, /).  (i)) Find the maximal and minimal elements. (ii) Find the greatest and least element,if exists.  (iii) Find lub of {2,9}, if exist. (iv) Find glb of {60,72}, if it exist. | **(6)** |