E 3216

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Reg. No..............................

Name..............................

B.C.A. DEGREE (C.B.C.S.S.) EXAMINATION, APRIL 2012

Second Semester

DISCRETE MATHEMATICS

(Complementary Course to B.C.A)

Time : Three Hours

Maximum Weight : 25

Part A (Objective Type Questions)

Answer all questions.
Each bunch of 4 questions has weight 1.

I. 1 Let $A=\{1,2,3,4\}$ and $B=\{1,3\}$. How many subsets of A are disjoint from B ?

2 State the contrapositive of the following statement :

If $x=y$, then $f(x)\neq f(y)$.

3 Let $A=\{1,\{1,2\}\}$ and $B=\{A,1,2\}$. What is $A\cap B$?

4 How many one-to-one functions are there from A = {1, 2, 3} to itself ?

II. 5 Let X ={A, B, C}. What is the number of ordered samples of size four from X, where repetition is allowed ?

6 In how many ways 10 people can be lined up in a row ?

7 Let X be a set with $|x|=8$. How many three element subsets does X have ?

8 A coin is tossed 50 times. How many of these have exactly 20 heads and 30 tails ?

III. 9 Give an example of a proposition with exclusive or.

10 How many Boolean functions are there of two arguments ?

11 State the distributive law of Boolean algebra.

12 Symbolise the *modus ponens* rule of inference.

IV. 13 How many edges are there for a tree with 100 vertices ?

14 Draw a spanning tree of K_5.

15 Give an example of a graph which is not planar.

16 What can we say about the degree of each vertex of a binary tree ?

$(4\times 1=4)$

Turn over

Part B (Short Answer Type Questions)

Answer any **five** *questions.*
Each question has weight 1.

17 Encode the four bits 0101.

18 Show that $n^2 > n+1$ for $n \geq 2$.

19 Find the number of unordered samples of size four (repetition allowed) from the set {A, B, C, D, E} when all samples must contain at least two A's.

20 How many six digit numbers (no leading zeros allowed) have no repeated digits and are even ?

21 State the chain rule of inference with an example.

22 Write *two* advantages of proof by resolution.

23 How many non-isomorphic simple graphs can be drawn with four vertices ?

24 State the Eulers theorem for planar graphs.

$(5 \times 1 = 5)$

Part C (Short Essay Type Questions)

Answer any **four** *questions.*
Each question has weight 2.

25 Let $A = \{a, b, c, d\}$ and consider the relation

$R = \{(a,a)(a,b)(a,c)(a,d)(b,b)(b,d)(c,c)(c,d),(d,d)\}$ Show that R is a partial ordering and draw its Hasse diagram.

26 Let $A = \{1, 2, 3\}$ and B $\{1, 2, 3\}$

(a) Find all functions $f : A \to B$

(b) One-to-one functions $f : A \to B$

(c) Onto function $f : A \to B$.

27 Consider a set of 10 people $\{P_1, P_2, \ldots, P_{10}\}$

(a) How many 6-member teams can be formed ?

(b) How many do not contain both $\{P_2, P_4\}$?

28 Suppose 20 people are divided into 6 (numbered) committees so that 3 people each serve on committees C_1 and C_2, 4 people each on committees C_3 and C_2, 2 people on committee C_5 and 4 people on committee C_6. How many possible arrangements are there ?

29 Explain the conjunctive normal form and disjunctive normal form using examples.

30 Write the Konigsberge bridge problem and state its solution using graph theory.

(4 × 2 = 8)

Part D (Essay Type Questions)

Answer any **two** *questions.*
Each question has weight 4.

31 Use the truth table method to prove the De Morgan laws

$$(A \cup B)' = A' \cap B'$$

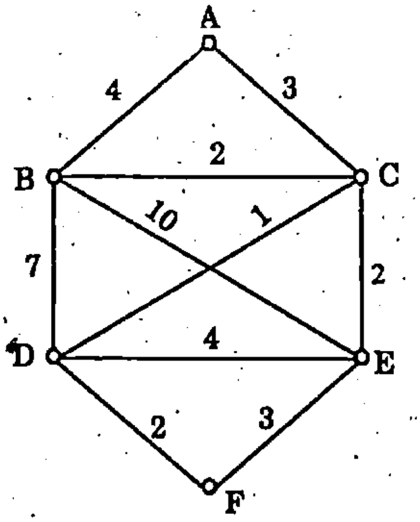
$$(A \cap B)' = A' \cup B'$$

32 Suppose that you have 15 friends. Find the number of ways you can

(a) Choose 4 to be president, vice president, secretary and treasurer of your club.

(b) Lend them four books titles A, B, C and D so that no person gets more than one book.

33 Use Dijikstra's algorithm to find the shortest path from A to F.



(2 × 4 = 8)