

Goa Vidyaprasarak Mandal's  
Gopal Govind Poy Raiturcar College of Commerce and Economics  
Ponda Goa

B.C.A. (Semester II) Examination, April 2012  
**BCA204 - DISCRETE MATHEMATICS**

Duration: 2 hours

Marks: 50

INSTRUCTIONS:

1. All questions are compulsory
2. Figures to the right indicate full marks

Q.1. Answer the following:

- i. The fifth term in the expansion of  $(a + 2b)^8$  is \_\_\_\_\_ (1)
- ii. Write the complete expansion of  $(x - y)^7$ . (1)
- iii. The logic symbol for XOR is \_\_\_\_\_. (1)
- iv. If p and q are two statements with truth values T and F respectively, then the truth value of  $p \vee q$  is \_\_\_\_\_. (1)
- v. Draw the truth table for  $p \uparrow q$ . (1)
- vi. In a class of 40 students, 14 take English, 29 take Chemistry and 5 students have taken both subjects. The number of students who haven't taken either class is \_\_\_\_\_. The number of students who have taken either of the two subjects is \_\_\_\_\_. Also, \_\_\_\_\_ students have taken only English and \_\_\_\_\_ students have taken Chemistry but not English. (1 x 4 = 4)
- vii. Write out the power set of the set  $A = \{1, 2\}$ . (1)

Q.2. a) Prove by the principle of Mathematical Induction that

$$1 + 2 + \dots + n = n(n + 1)/2. \quad (3)$$

b) Find the inverse of the function f defined by  $f(x) = 4x + 2$ . Also find  $f \circ g(x)$  and  $g \circ f(x)$  when  $g(x) = x^2 - 1$ . (3)

c) Convert  $(111111001.1011)_2$  to decimal number system. (4)

OR

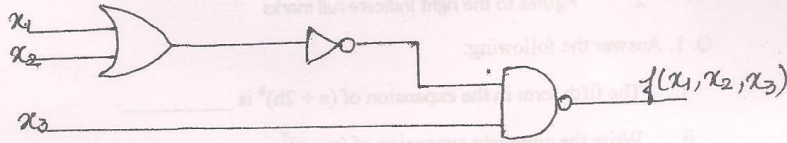
Q.II. x) Prove by the principle of mathematical induction that  $4+8+12+\dots+4n = 2n(n+1)$  (3)

y) If  $f(x) = 2x^3 - 1$  when  $x \leq 0$ ;  $x^2$  when  $x > 0$  find  $f(2)$  and  $f(-2)$  (3)

z) Convert 1569 from decimal to (i) octal and (ii) hexadecimal number system. (4)

Q.3. a) If  $A = \{1, 2, 3, 4, \}$  and  $B = \{p, q\}$  find  $A \times B$ . (1)

b) Find the output for the given inputs in the following circuit diagram: (4)  
 $x_1 = 0, x_2 = 1, x_3 = 1$

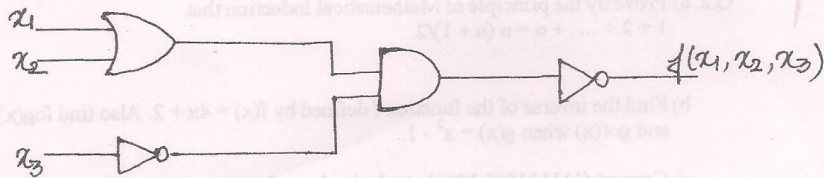


c) Prove that the relation  $R$  on the set of integers  $Z$  defined as  $R = \{(x, y)/x-y$  is divisible by 3;  $x, y \in Z\}$  is an equivalence relation. (5)

**OR**

Q.III x) If  $A = \{1, 3, 5, 7, 9\}$  and  $B = \{2, 3, 5, 7\}$  find  $A \Delta B$ . (1)

y) Find the output for the given inputs of the following circuit diagram: (4)  
 $x_1 = 1, x_2 = 0, x_3 = 1$



z) Give an example of a relation R which is reflexive and transitive but not symmetric. Give reasons for your answer. (5)

Q.4. a) State the converse, inverse and contrapositive of the statement: "If it rains tomorrow I shall not go to college." (3)

b) In a college there were 150 students enrolled for F. Y. B. C. A., the number of students who opted for subjects Mathematics, English and Java were 50, 40 and 47 respectively. 15 opted for both Maths and English, 14 opted for both English and Java, 13 for both Maths and Java, and 5 opted for all three papers. Draw a Venn diagram to represent the given information and thus find out the number of students who didn't opt for any of these three subjects. (3)

c) What is the NAND gate in Boolean Algebra? Draw the NAND operation logic diagram, gate symbol and truth table. (4)

OR

Q.IV. x) Draw the truth table for  $(\sim p \leftrightarrow q) \wedge r$  (3)

y) If A is the set of all odd natural numbers less than 10, B is the set of all prime numbers less than 10, and C is the set of all squares of natural numbers less than 10, find (i)  $A \cup (B - C)$  and (ii)  $(A \Delta B) \times C$ . (3)

z) Draw the logic gate symbol and the truth table for the XOR gate. (4)

Q.5. a) There are 5 boys and 6 girls. A committee of 4 is to be formed so that it must contain at least one boy and at least one girl. In how many ways can this be done? (5)

b) Write a short note on Finite State Machine (5)

OR

Q.V. x) In how many ways can 3 women be selected out of 15 women if one particular woman is always included and two particular women are always excluded? (5)

y) Write a short note on the various types of Grammars. (5)

XXXXXXXXXXXXXXXXXXXX