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GOPAL GOVIND POY RAITURCAR COLLEGE OF COMMERCE AND ECONOMICS, PONDA-GOA

B.C.A (SEMESTER-II) EXAMINATION, APRIL 2019

BCA204 DISCRETE MATHEMATICS

Duration: 2 hours Marks: 50

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Instructions:

1. All questions are compulsory. However internal choice has been provided for Q.2 - Q.5
2. Figures to right indicate full marks.
3. Use of non-programmable calculators are allowed.

Q 1) Answer the following. (10×1=10)

(a) Base for the binary number system is _____.

(b) The symbol for NOR gate is _____.

(c) If $f(x) = 3x - 5$ then $f(2)$=_____.

(d) If $A = \{1,2,3,4\}, B = \{2,4,6,8\}$ then $A \cap B$ =_____.

(e) 0! =____.

(f) How many different seating arrangements can be made for 5 students on 2 chairs?

(g) Length of the string 'xxyxxyyx'.

(h) Negation of "p: n is a prime number" is _____.

(i) Let $C = \{a, b, c\}$ and $D = \{2,4\}$ $then$ $C \times D =$ _____.

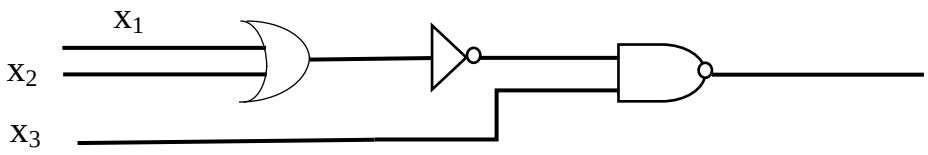
(j) C_n^n=_____.

Q 2) Answer the following.

(a) Convert $(101101)_2$ to its equivalent decimal form and convert$(6592)_{10}$ to hexadecimal form. **(4)**

(b) Prove that $1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n(n+1)(2n+1)}{6}$ using mathematical induction. **(3)**

(c) Find the output for input $x_1 = 1,\ x_2 = 0$ &$x_3 = 1$ from the following circuit diagram. **(3)**

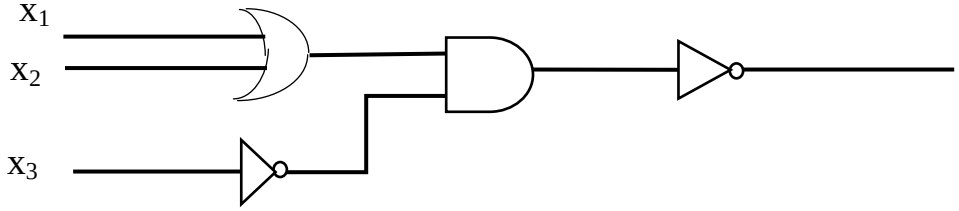


OR

(d) Convert $(6438)_{10}$ to binary form and convert $(654)_8$ to decimal form. **(4)**

(e) Prove that $4 + 8 + 12 + \cdots + 4n = 2n(n + 1)$ using mathematical induction. **(3)**

(f) Find the output for input $x_1 = 0, x_2 = 1$ &$x_3 = 1$ from the following circuit diagram. **(3)**



Q 3) Answer the following.

(a) $A = \{L, O, G, A, R, I, T, H, M\}, B = \{T, H, E, O, R, Y\}$, $C = \{T, H, E, O, R, M, S\}$. Verify that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$. **(3)**

(b) Find truth values for

(i) $\sim(\sim p \vee \sim q)$

(ii) $(p \to q) \leftrightarrow (\sim p \vee q)$ **(5)**

(c) Find the 3rd term in the expansion of $(\frac{a}{2} + 2)^8$. **(2)**

OR

(d) $X = \{1,2,3,4, \ldots \ldots, 15\}$ is the universal set $A = \{1,3,5,8,9,10,12,15\}$, and $B = \{2,3,4,6,8,9,10,11,13\}$. Verify that

(i) $(A \cup B)^{\mathsf{C}} = A^{\mathsf{C}} \cap B^{\mathsf{C}}$

(ii) $A - B = A \cap B^{\mathsf{C}}$ **(3)**

(e) Prove that $[(p \to q) \wedge (q \to r)] \to (p \to q)$ is a tautology. **(5)**

(f) Find the middle term in the expansion of $\left(x - \frac{2y}{3}\right)^{10}$. **(2)**

Q 4) Answer the following.

(a) A club has 5 girls and 7 boys. If 4 persons out of these are to be selected, find the total number of choices if:

(i) there is no restriction on gender

(ii) 3 boys and 1 girl is to be selected. **(2)**

(b) Out of 200 students appearing in an examination, 140 passed in mathematics & 100 passed in statistics. If 50 of them fail in both mathematics and statistics. Find the number of students who passed in both. **(5)**

(c) Prove that the relation R on the set of integers $\mathbb{Z}$ defined as $R = \{(x, y) | x - y \; is \; divisible \; by \; 0, x, y \epsilon \mathbb{Z}\}$ is an equivalence relation. **(3)**

OR

(d) Find n, if

(i) $P_3^n = P_4^n$

(ii) (ii) $P_3^{2n} = 60P_2^n$. **(2)**

(e) In a recent survey of 400 students in a college, 100 were listed as left handlers and 150 were blue eyed, 75 were listed as both blue eyed and left handlers. Find out how many students were neither blue eyed nor left handers. **(5)**

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

Q 5) Answer the following.

(a) Draw the symbol and truth table for NOT gate. **(3)**

(b) If $L_1 = \{z, xy, z^2\}$ and $L_2 = \{y^2, xyz\}$ then find L_1L_2 and L_2^2. **(5)**

(c) Find $f(g(x))$ if $f(x) = x^2$, $g(x) = 5x - 6$. **(2)**

OR

(d) Write the truth table for OR gate and draw the symbol of it. **(3)**

(e) If $L = \{y^2\}, L^2 = \{y^4\}, L^3 = \{y^6\}$ then find L^* and $L^{+.}$ **(5)**

(f) If $f(x) = x^2 - 6x + 9, \; 0 \leq x \leq 4$ find f(0), f(3), f(5) if they exists. **(2)**

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