

Goa Vidyaprasarak Mandal's
GOPAL GOVIND POY RAITURCAR COLLEGE OF COMMERCE & ECONOMICS
PONDA-GOA
B.C.A (SEMESTER – II) EXAMINATION, MARCH/APRIL 2014
DISCRETE MATHEMATICS

Duration: 2 Hrs

Marks: 50

INSTRUCTIONS:

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

Q.1) Answer the following.

- i) Draw the truth table for $p \leftrightarrow q$ (1)
- ii) The logic symbol for NOR gate is..... (1)
- iii) Convert $(10101)_2$ to decimal number system. (2)
- iv) If the truth values of statements p,q and r are F,T and T respectively, then the truth table of the statement $(\sim p \vee q) \wedge r$ is..... (2)
- v) Write the complete expansion of $(x-y)^3$ (2)
- vi) Convert the following decimal number to binary form 6721 (2)

Q.2.a) Prove that the relation R on the set of integers Z defined as

- $R = \{ (x,y) / x-y \text{ is divisible by } 5, x,y \in Z \}$ is an equivalence relation. (5)
- b) If $X = \{1,2,3,4\}$, $A = \{3,4\}$, $B = \{1,2,3\}$, Verify D'Morgans laws. (3)
 - c) If $A = \{1,2,3\}$ and $B = \{2,4,5\}$, find $A \times B$. (2)

OR

Q.2.x) If $A = \{1,2,3,4\}$, $B = \{3,4,5,6\}$ and $C = \{1,5,6,7,8\}$. Verify that

- $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ (5)
- y) Give an example of a relation that is symmetric but neither reflexive nor transitive. Justify. (3)
 - z) Let $A = \{1,2,3\}$ and a relation on A be $R = \{(1,1), (1,2), (2,1), (2,2), (2,3), (3,3)\}$. Prove that the relation R is reflexive, not symmetric, not transitive. (2)

Q.3.a) A town has a total population of 40000, out of which 400 people own cars, 10000 people own bicycles and 300 own both cars and bicycles. How many in the town do not own either? (4)

- b) If $g(y) = \frac{1}{y-1}$, find the value of $g[g(g(y))]$ (4)
- c) In how many ways a 3 digit number can be formed using the digits 4,8,7,0 (2)

OR

Q.3.x) Find the number of arrangements of the letters of the word STUDENTS. (2)

y) If $f(x) = \frac{2x+1}{2x-1}$. Find $f(3x)$. (4)

z) In a recent survey of 400 students in a college, 100 were listed as left handers and 150 were blue eyed, 75 were listed as both left handers and blue eyed. Find out how many students are neither blue eyed nor left handers. (4)

Q.4.a) Show that $\sim(p \rightarrow q)$ is equivalent to $p \leftrightarrow \sim q$ (3)

b) Write a short note on XOR gate (2)

c) Prove by the principle of mathematical induction

$$p(n) = 4 + 8 + 12 + \dots + 4n = 2n(n+1) \quad (5)$$

OR

Q.4.x) P Prove by the principle of mathematical induction that

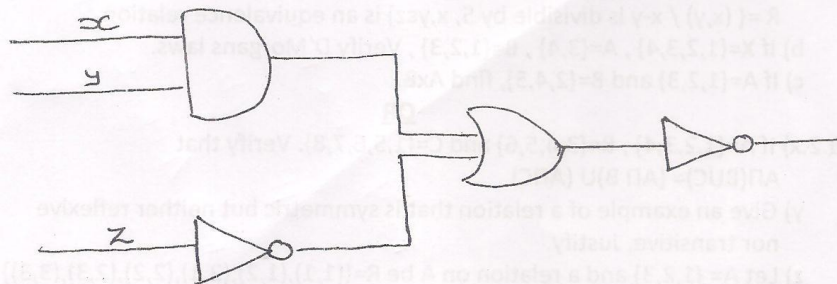
$$P(n) = 1.3 + 2.4 + 3.5 + \dots + n(n+2) = \frac{n(n+1)(2n+7)}{6} \quad (5)$$

y) Explain OR gate by giving symbol and truth table (2)

z) Verify if $\sim p \vee (p \vee q)$ is a tautology. (3)

Q.5.a) Find the output for a given input from the following circuit.

Inputs $x=1, y=0$ and $z=1$. (5)

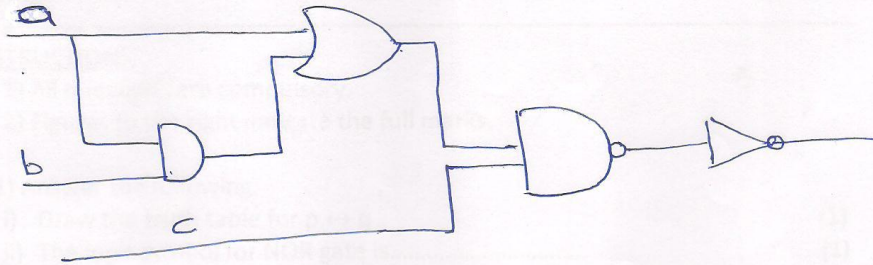


b) Write a short note on the finite state machine. (5)

OR

Q.5.x) Find the output for a given input from the following circuit.
Inputs $a=0$, $b=1$ and $c=0$.

(5)



y) Write a short note on the various types of grammars.

(5)

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