Digital Electronics Assignment No-2

Q1) What are universal gates? why they are called as universal gates?

Q2) State and prove De-morgan's Theorem.

Q3) Explain universal gate with Truth Table

Q4) Explain Basic gate with Truth Table

Q5) Explain Exclusive gate with Truth Table

Q6) Reduce the expression $f = \overline{\overline{AB} + \bar{A} + AB}$

Q7) Apply Demorgan's Theorem to the expression

$$f = \overline{\overline{AB}(CD + \bar{E}F)(\overline{AB} + \overline{CD})}$$

Q8) De morganize $f = \overline{(A+\bar{B})(C+\bar{D})}$

Q9) Reduce the expression $f = A[B + \bar{C}\,\overline{(AB + A\bar{C})}]$

Q10) Reduce the expression $f = A + B[AC + (B+\bar{C})D]$.

Q11) Reduce the expression $f = \overline{(A+\overline{BC})}(A\bar{B} + ABC)$

Q12) Reduce the expression $f = (B + BC)(B + \bar{B}C)(B + D)$

Q13) Reduce the expression $f =$

Show that $AB + A\bar{B}C + B\bar{C} = AC + B\bar{C}$

14 Design a circuit using gates to realise the following functions

14.1) $Y = (A + BC)(B + \bar{C}A)$

14.2) $Y = \overline{AB} \cdot \overline{A\bar{C}} \cdot \overline{BC}$

14.3) $Y = (\overline{A+B}) + (\overline{A+C}) + \overline{(B+\bar{C})}$

14.4) $Y = BC + A\bar{C}$

14.5) $Y = (A+C) \cdot (B+\bar{C})$

K-map

Q. No 15

15.1) Design a logic circuit using minimum number of basic gates for the following Boolean expression

$$f = \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}C\bar{D} + \bar{A}\bar{B}CD + \bar{A}B\bar{C}\bar{D} + \bar{A}B\bar{C}D + \bar{A}BC\bar{D} + AB\bar{C}D + AB\bar{C}\bar{D} + AB\bar{C}D + ABC\bar{D}.$$

15.2) Simplify the Boolean Expression using K-map

$$f = \bar{A} + AB + AB\bar{D} + A\bar{B}\bar{D} + C.$$

15.3) Obtain the simplified expression using k-map

15.5) $f = \bar{A}\bar{B}\bar{D} + \bar{A}\bar{B}\bar{C}\bar{D} + \bar{A}BD + AB\bar{C}D.$

15.4) Obtain the simplified expression using K-map

$$f = ABD + \bar{A}\bar{C}\bar{D} + \bar{A}B + \bar{A}C\bar{D} + A\bar{B}D.$$

Obtain the simplified expression using K-map

$$f = AB + A\bar{C} + C + AD + A\bar{B}C + ABC.$$

Boolean Algebra Numericals

Q. No. 16

16.1) Expand $\overline{A} + \overline{B}$ to minterms and maxterms

16.3) Expand $A + B\overline{C} + ABD + ABCD$ to minterms and maxterms

16.4) Expand $A(\overline{B}+A)B$ to minterms and maxterms.

16.5) Expand $A(\overline{A}+B)(\overline{A}+B+\overline{C})$ to minterms and maxterms

16.6) Expand $AB + A\overline{C} + Bc$ into canonical SOP form

16.3) Expand $(A+B)(A+C)(B+\overline{C})$ into canonical POS form.

K-map Numericals

Q.No. 17

17.1) Reduce using mapping the expression

$f = \Sigma m(2, 3, 6, 7, 8, 10, 11, 13, 14)$.

17.2) Reduce using mapping the expression

$f = \Sigma m(0, 1, 2, 3, 5, 7, 8, 9, 10, 12, 13)$.

and implement the real minimal expression in universal logic.

17.3) Reduce ~~Eto~~ using mapping the expression

$f = \Sigma m(0, 1, 3, 4, 5, 6, 7, 13, 15)$

and implement the real minimal expression in universal logic.

17.4) Reduce using mapping the following expression and implement the real minimal expression in universal logic. $f = \Sigma m(0, 2, 4, 6, 7, 8, 10, 12, 13, 15)$.

17.5) minimise the four variable logic function using K-map.

$f(A, B, C, D) = \Sigma m(0, 1, 2, 3, 5, 7, 8, 9, 11, 14)$.

Don't care terms in K-map **Q. No-18**

18.1) Reduce the expression

$$f = \Sigma m(1, 5, 6, 12, 13, 14) + d(2, 4).$$

Minimize the following expression using K-map

18.2) $f(A, B, C, D) = \Sigma m(1, 4, 7, 10, 13) + \Sigma d(5, 14, 15)$

18.3) $f(A, B, C, D) = \Sigma m(4, 5, 7, 12, 14, 15) + \Sigma d(3, 8, 10)$

18.4) $f(W, X, Y, Z) = \Sigma m(1, 3, 7, 11, 15) + \Sigma d(0, 2, 5).$

18.5) $f(A, B, C, D) = \Sigma m(0, 1, 2, 3, 4, 5) + d(10, 11, 12, 13, 14, 15)$

K-map POS form

Q.No- 19

19.1) Reduce using mapping the expression $f = \Pi M(4, 6, 11, 14, 15)$ and implement the real minimal expression in universal logic.

19.2) Reduce using mapping the expression $f = \Pi M(2, 8, 9, 10, 11, 12, 14)$. and implement the real minimal expression in universal logic.

19.3) Reduce using mapping the following expression and implement the real minimal expression in universal logic

~~$f = \Pi M(0, 2, 4, 6, 7, 8)$~~ $f = \Pi M(1, 3, 5, 9, 11, 14)$.

minimize the following expression using K-map

19.4) $F(A, B, C, D) = \Pi M(0, 3, 7, 8, 9, 10, 11, 15) \cdot \Pi d(2, 4)$.

19.5) $F(A, B, C, D) = \Pi M(6, 7, 8, 9) \cdot d(10, 11, 12, 13, 14, 15)$.