Indian Institute of Information Technology Chittoor, Sri City

Name of the Exam: Digital and Electrical Circuits Duration: 3 hours Max. Marks: 100

Roll No.:_____ Room No.: _____ Seat No.: _____

Name: _____ Invigilator's Signature: _____

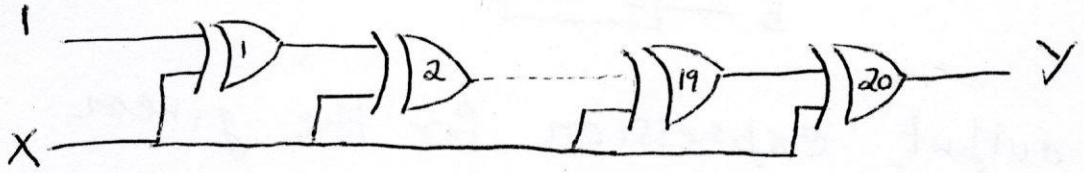
Instructions: 1. This is a closed book exam

2. Scientific/Basic Calculators allowed

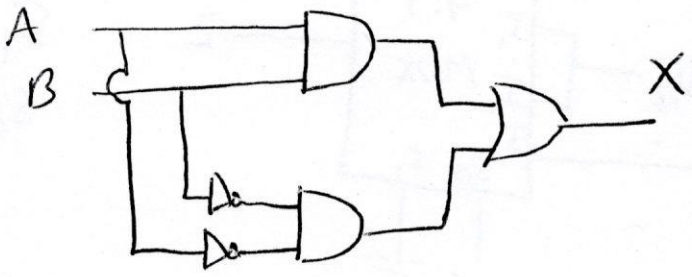
3. Attach question paper with answer sheet

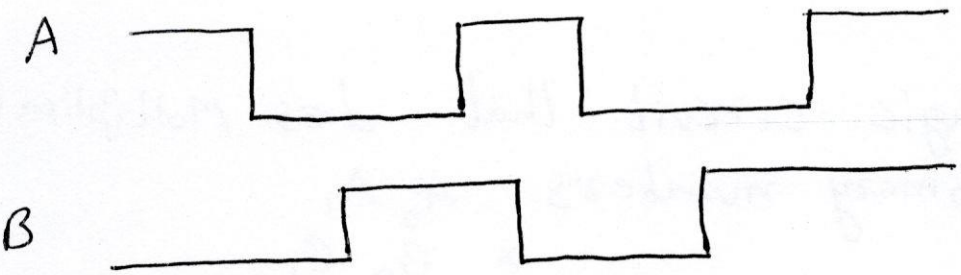
{Questions 1-15 carry 6 marks each, MCQ's carry 1 mark each}

1) a] The given circuit consists of cascade of 20 XoR gates. Determine the expression for output Y.



b) Draw the output wave form X for the given circuit



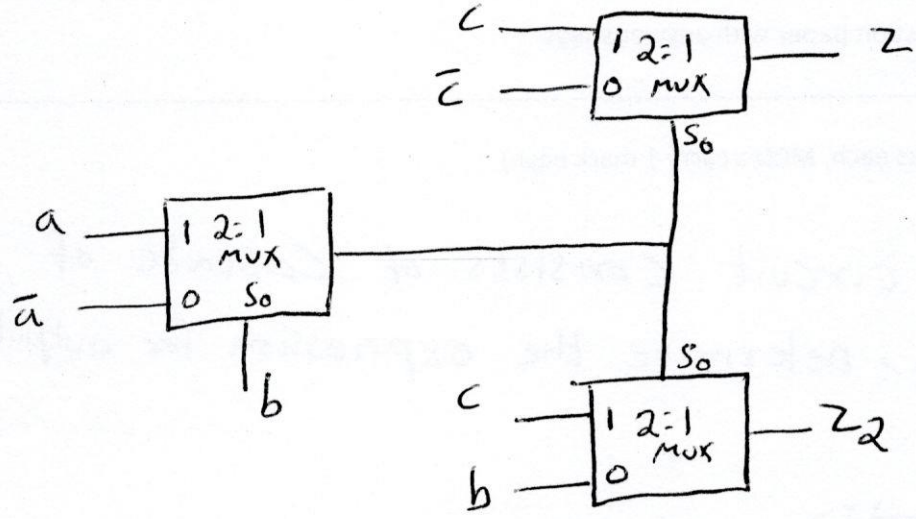


2) perform the following Subtraction

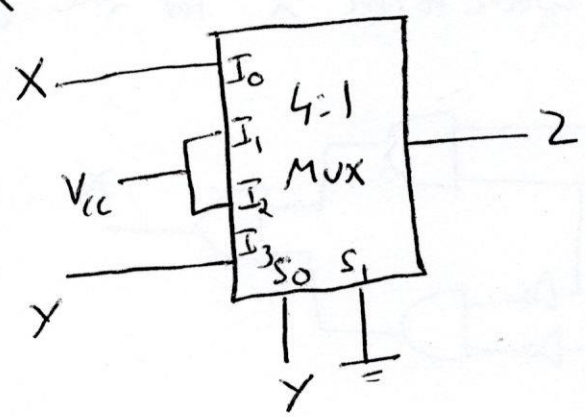
a) 11001 - 10110 using 1's complement

b) 11011 - 11001 using 2's complement

3) a) Derive the expression for Z_1 & Z_2



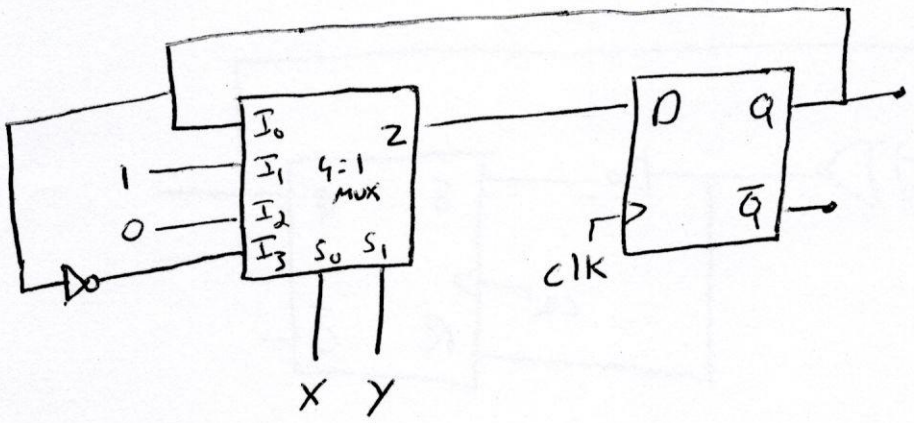
b) The output expression for the given 4:1 MUX



4) Design a logic circuit that does Multiplication of two bit binary numbers $A_0\ A_1$

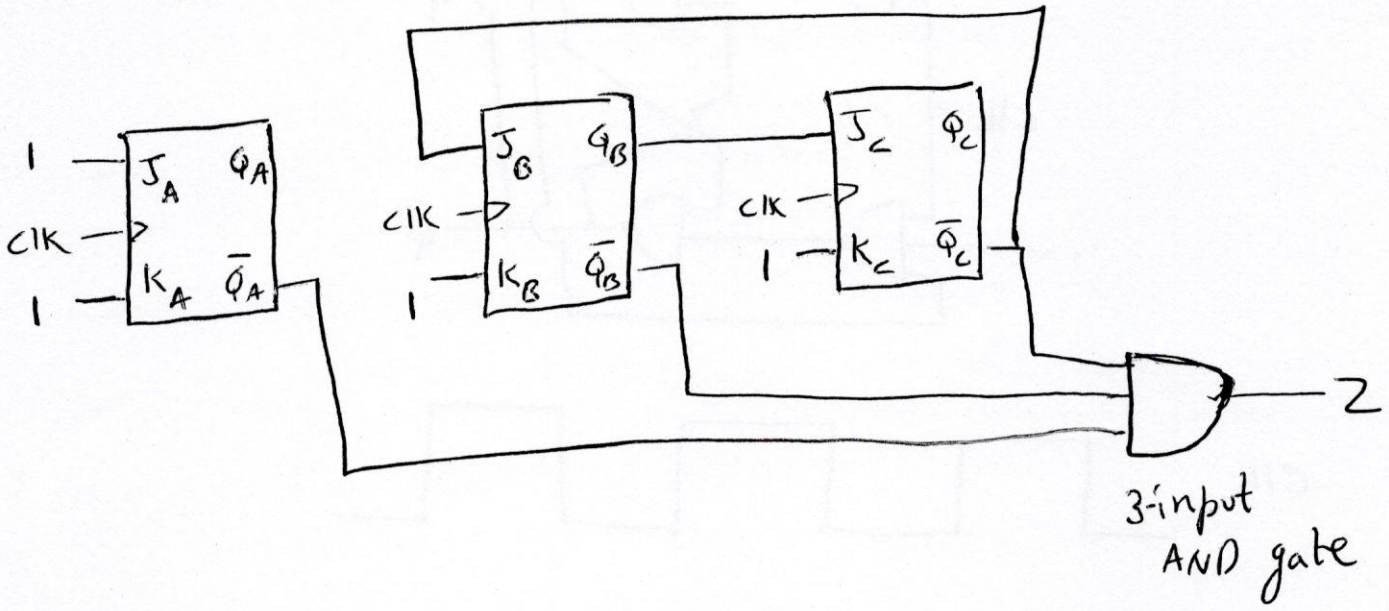
$\times\ B_0\ B_1$

5) write the state table & state equations for the given circuit

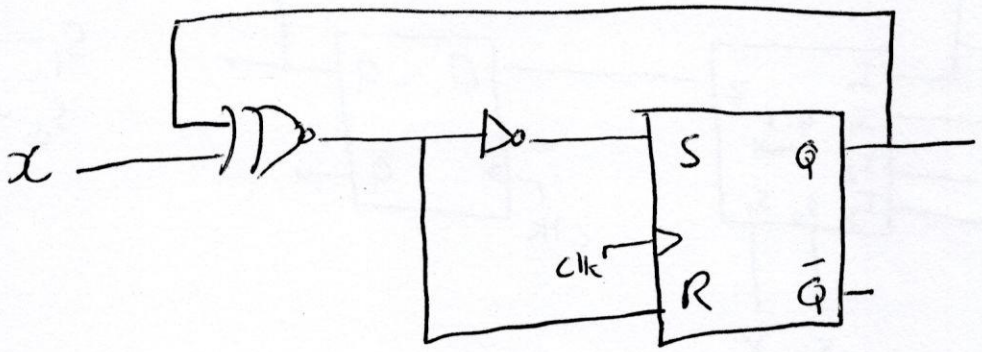


S_1 - MSB
S_0 - LSB

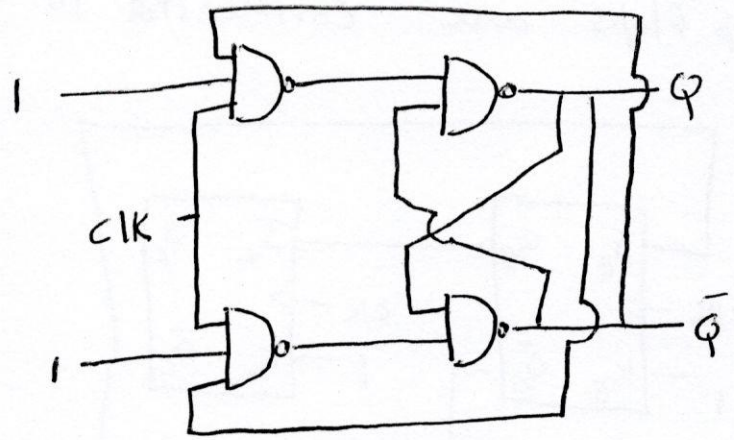
6) For the given circuit, output z becomes logic one after every "N" clock cycles. Determine the value of N.
Assume initially $Q_A = Q_B = Q_C = 0$.
All the flip flops are connected to common CLK.

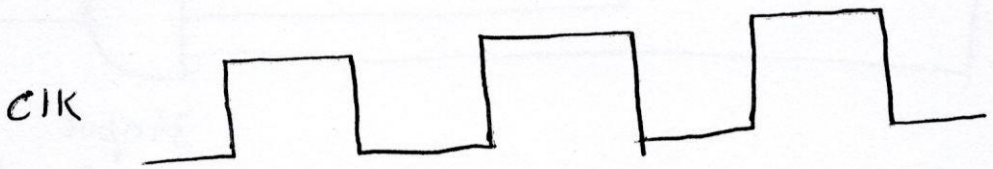


7) a] write the state table & state equation for the given circuit



b) Draw the output waveform at Q for the given circuit. Assume Q is low initially





Part-B

Solution of first order differential Equation

$\frac{dx}{dt} + Px = K$ is $x(t) = e^{-Pt}\int Ke^{Pt}\,dt + Ce^{-Pt}$

$\int e^{xt}\,dt = \frac{1}{x}e^{xt}$ $\quad \frac{d}{dx}e^{ax} = ae^{ax}$

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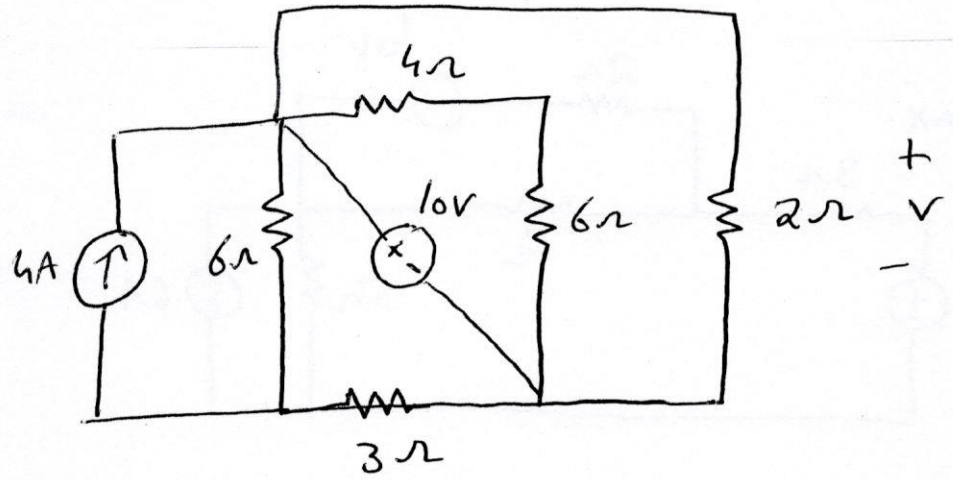
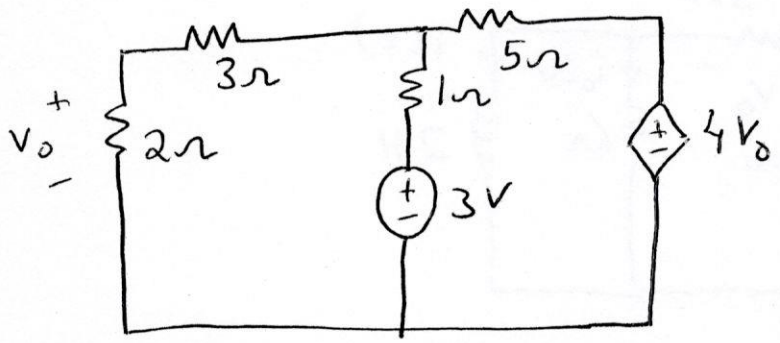
8) using superposition theorem, find voltage drop across 2Ω resistor

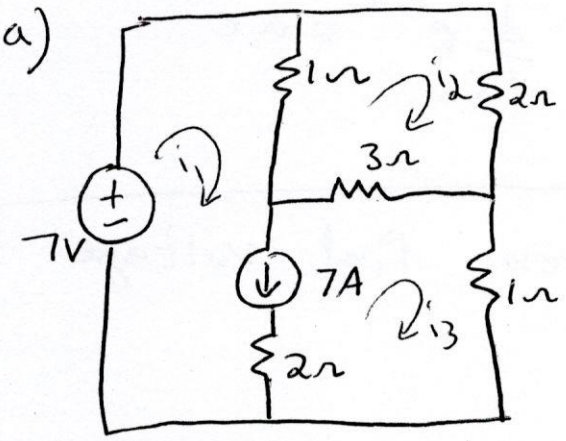


9) find V_o

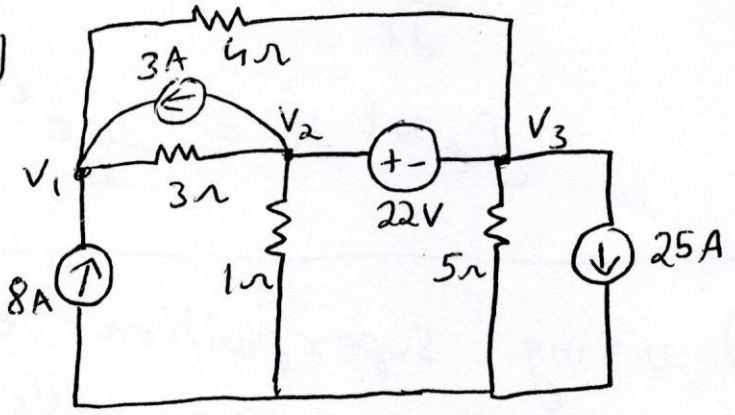


10) Using node/super node and Mesh/Supermesh analysis, write equations for the given circuits

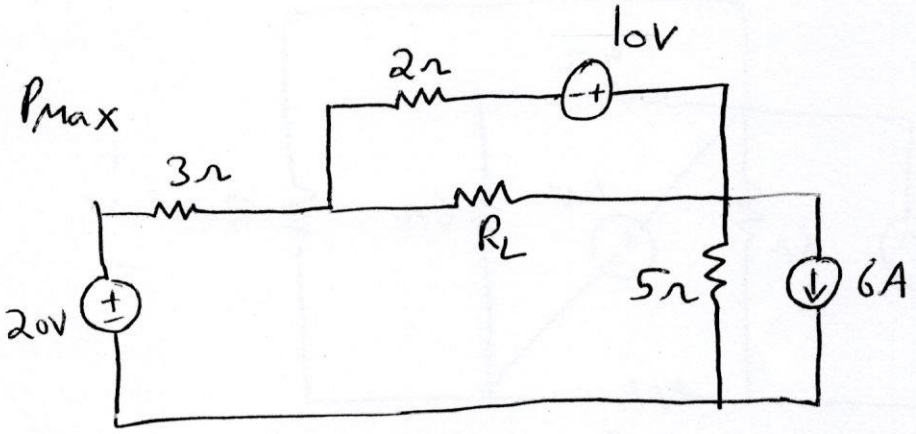
a)



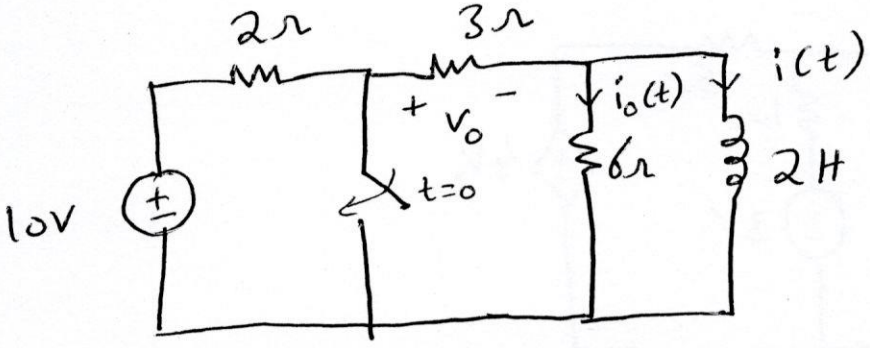
b)



11) Find P_{max}

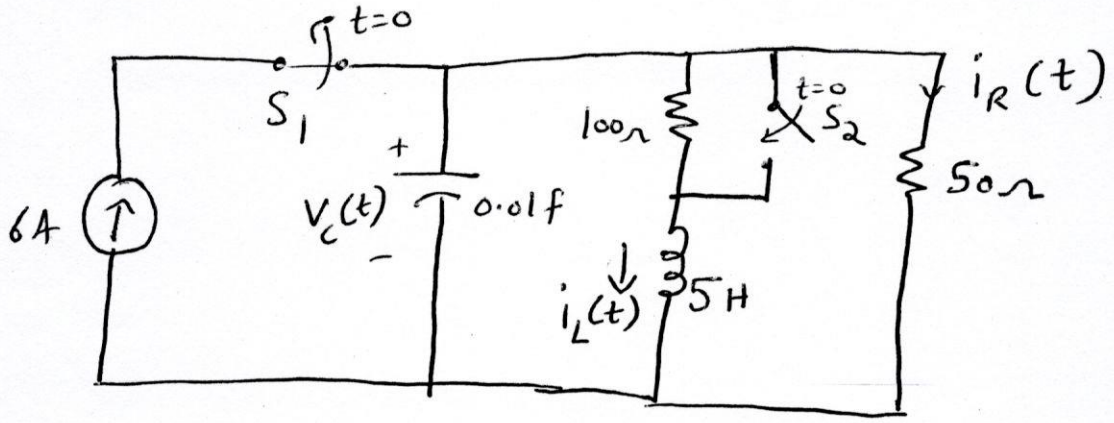


12) Derive expression for $i_o(t)$, $i(t)$ & $V_o(t)$ for $t>0$. Switch is closed at $t=0$

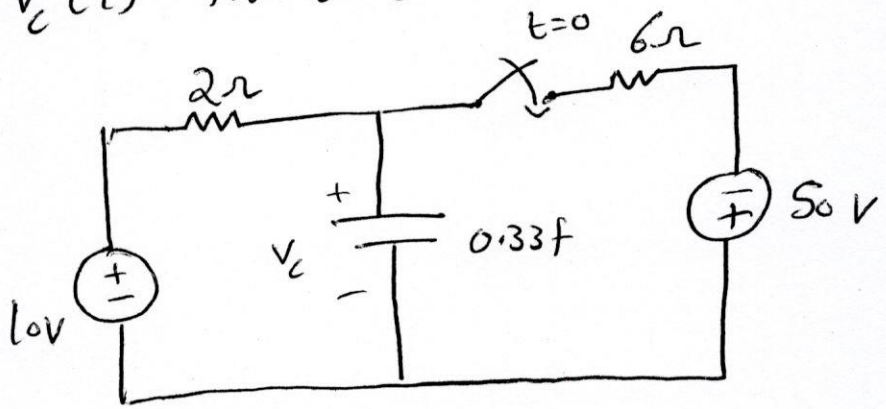


13) for the given circuit, find
$i_L(0^+)$, $V_c(0^+)$, $i_R(0^-)$, $i_R(0^+)$, $i_L(t)$ for $t>0$

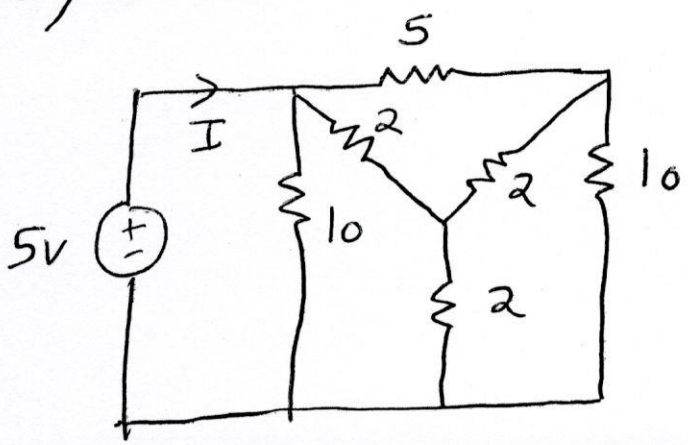
At $t=0$, S_1 is opened & S_2 is closed.



14) Switch is closed at $t=0$.
Find $V_c(t)$ for $t>0$



15) Find I



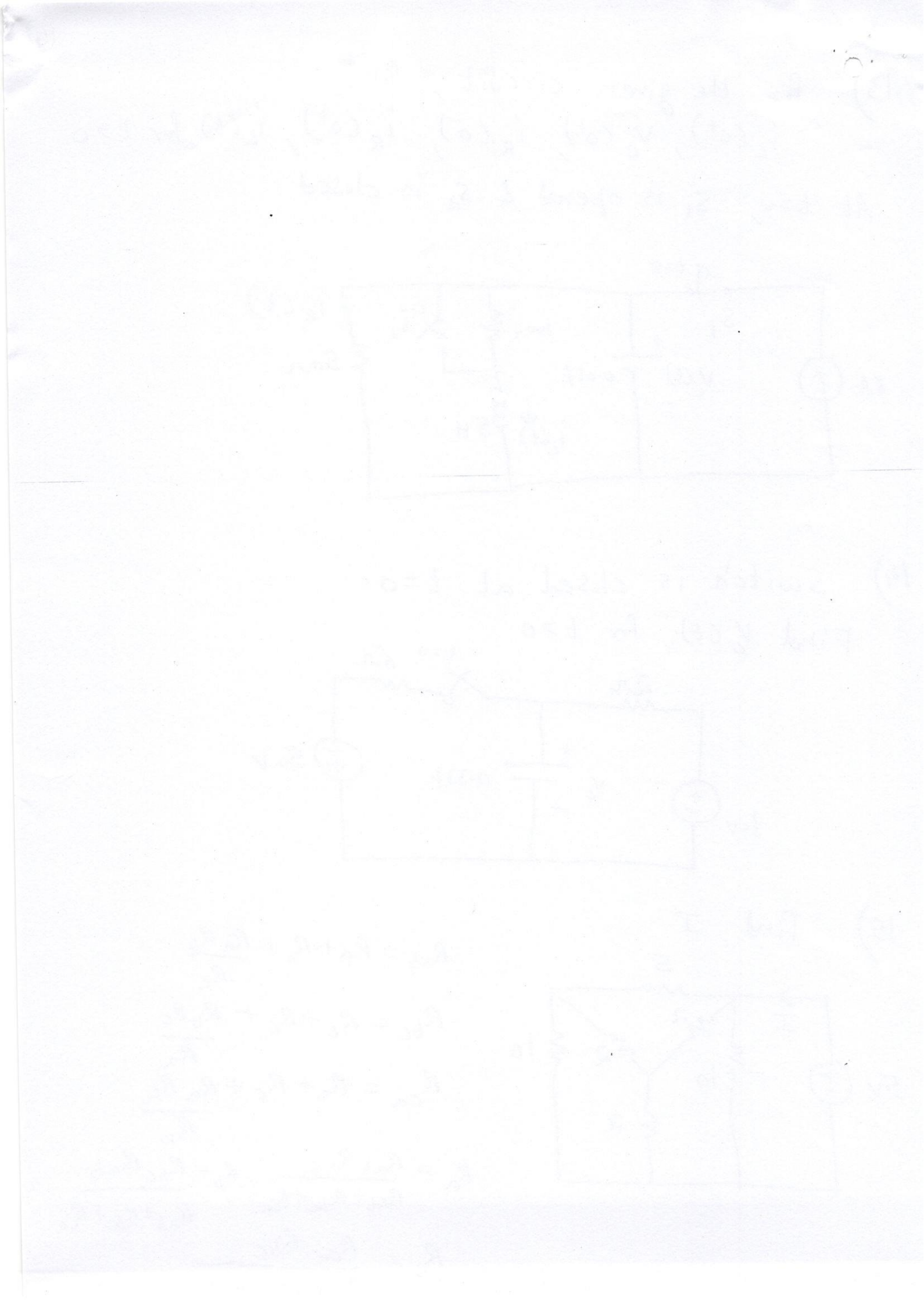
$$R_{ab} = R_a + R_b + \frac{R_a R_b}{R_c}$$

$$R_{bc} = R_b + R_c + \frac{R_b R_c}{R_a}$$

$$R_{ca} = R_a + R_c + \frac{R_a R_c}{R_b}$$

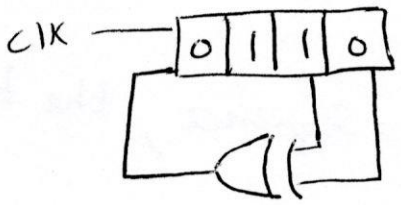
$$R_a = \frac{R_{ab} R_{ac}}{R_{ab} + R_{bc} + R_{ca}} \qquad R_b = \frac{R_{bc} R_{ab}}{R_{ab} + R_{bc} + R_{ca}}$$

$$R_c = \frac{R_{ca} R_{bc}}{R_{ab} + R_{bc} + R_{ca}}$$



MCQ

1) After three clock pulses, the contents of SIPO shift register will be



a) 0010 b) 0101 c) 1110 d) 1010

2) If $XY=0$, the $X \oplus Y$ is equal to

a) $X+Y$ b) $\bar{X}+\bar{Y}$ c) XY d) $\bar{X}\bar{Y}$

3) The Max term designator of the term $\bar{A}+\bar{B}+C+\bar{D}$ in the K-map is

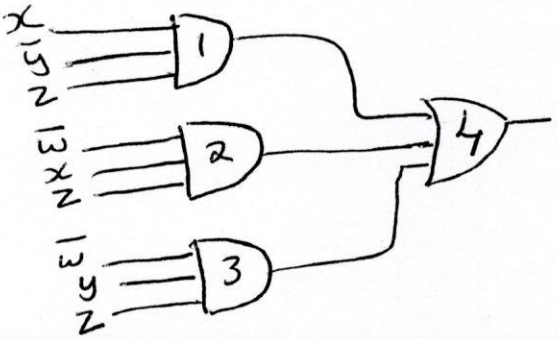
a) 2 b) 13 c) 10 d) 14

4) If $X\bar{Y}+\bar{X}Y=Z$, then $X\bar{Z}+\bar{X}Z$ is equal to

a) $\bar{Y}$ b) Y c) 0 d) 1

5) In the logic ckt, the redundant gate is

a) 1 ; Gate 1
b) 2 ; Gate 2
c) 3 ; Gate 3
d) 4 ; Gate 4



6) The difference bit output of a half-subtractor is same as

a) Difference bit output of FS
b) Sum bit output of HA
c) Sum bit output of FA
d) carry bit output of HA

7) In a 6-bit Johnson counter sequence, the total number of states are

a) 6 b) 8 c) 12 d) 15

8) The Transient response occurs

a) only in Resistive ckts b) only in capacitive ckts
c) only in Inductive ckts d) Both b & c

9) when a RC circuit connected to a constant voltage at $t=0$, the current passing through the circuit at $t=0^+$ is

a) Infinite b) zero c) V/R d) RC

10) If the voltage across capacitor $C = 200\mu f$ is $(100 - 50t)\,V$, the current in the capacitor is

a) $-50mA$ b) $-10\,mA$ c) $+15\,mA$ d) $\bar{\otimes}\,15mA$