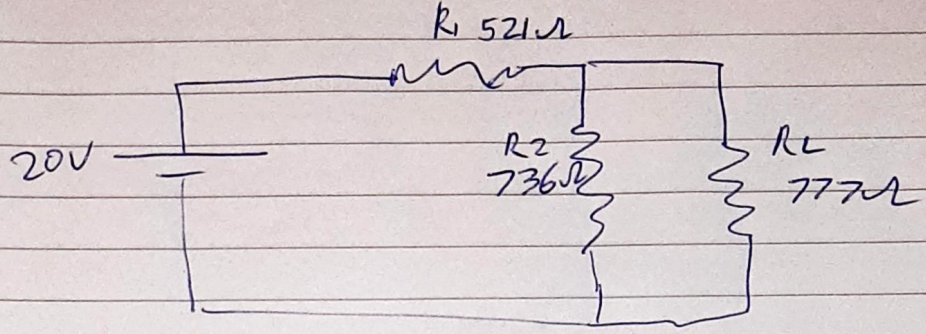
21236277

Question 1

a)



$R_1 = 500 + 21 = 521\Omega$

$R_2 = 500 + 236 = 736\Omega$

$RL = 500 + 277 = 777\Omega$

$$\frac{1}{R_{//}} = \frac{1}{736} + \frac{1}{777}$$

$R_{//} = 377,97$

$R_T = 377,97 + 521 = 898,97\Omega$

$V_T = I_T . R_T$

$20 = I_T \cdot 898,97$

$I_T = 0,02224A = 22,24mA$

$I_1 = I_T = 0,02224A = 22,24mA$

R_1 $I = 0,02224$ | $V = I.R$

$R = 521$ | $V = 11,59V$

$P = VI$

$P_{R1} = 11,59 \times 0,0224$

$= 0,25961W$

$= 259,61mW$

$V_{R_1} + V_{R_{11}} = V_S$

$11{,}59 + V_{R_{11}} = 20$

$V_{R_{11}} = 8{,}41$

$\therefore V_{R_2} \neq R_L = 8{,}41V$

R_2

$V = 8.41V$

$R = 736\Omega$

$V = I.R$

$I_2 = \frac{8{,}41}{736} = 0{,}01142A$

$= 11{,}42mA$

$P = V.I$

$= 8.41 \times 0.01142$

$= 0{,}09604W$

$= 96{,}04mW$

R_L

$V = 8.41V$

$R = 777\Omega$

$P = \frac{V^2}{R} = 0{,}09102W = 91{,}02mW$

$I_T = I_2 + I_3$

$0{,}02224 = 0{,}01142 + I_3$

$I_3 = 0{,}01082A = 10{,}82mA$

$P_T = V_T . I_T$

$P_T = 20.(0.02224)$

$P_T = 0{,}4448W$

$P_T = 444{,}80mW$

b) 3.6V t?
20kJ

i. 100mA
ii. 200mA

$P = \frac{W}{t}$

i) $P = VI$
$= (3.6)(0,1)$
$= 0,36W$

$P = \frac{W}{t}$

$0,36 = \frac{20000}{t}$

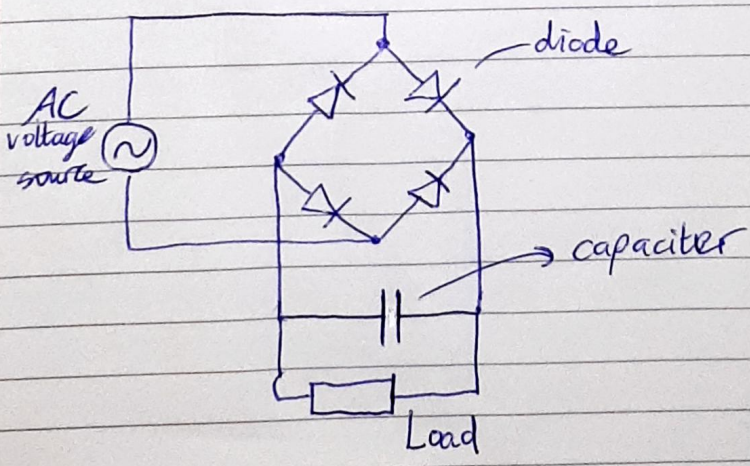
$t = \frac{20000}{0,36}$

$t = 55555,55556$ seconds
$t = 15,43$ hours

ii) $P \xrightarrow{\times 2} = \frac{W}{t}$

$t = \frac{20000}{0,36 \times 2}$ $= 27777,77778$ seconds
$= 7,72$ hours

c)



c) description of components:

Capacitor: slowly charges and releases energy which smooths out the waveform to ~~took~~ be closer to the fixed waveform of DC current.

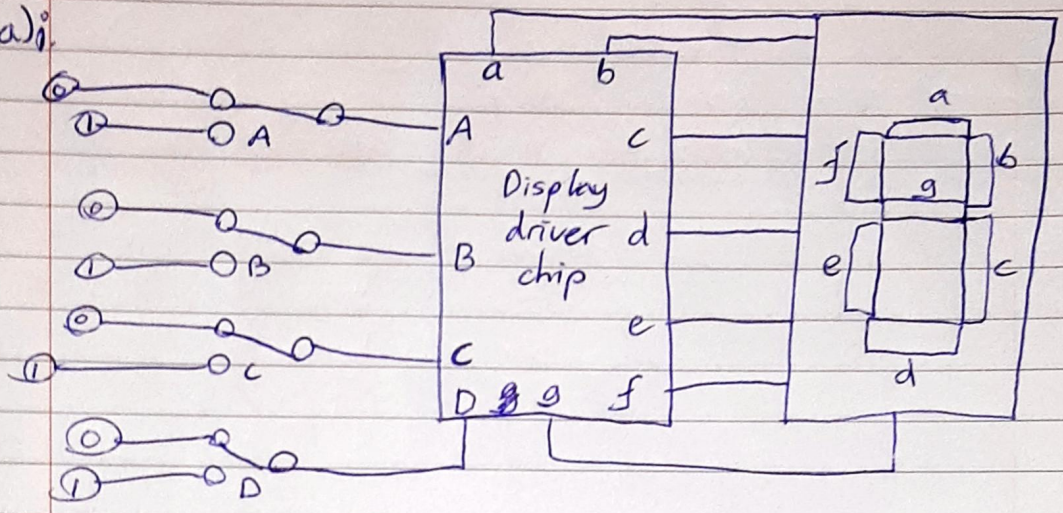
diodes only allow current to pass in one direction. Their arrangement provides voltage to output for both ~~half~~ halves of the AC cycle.

AC voltage source - supply power

load - a resistor to watch the effect of rectification.

Question 2

a) i.

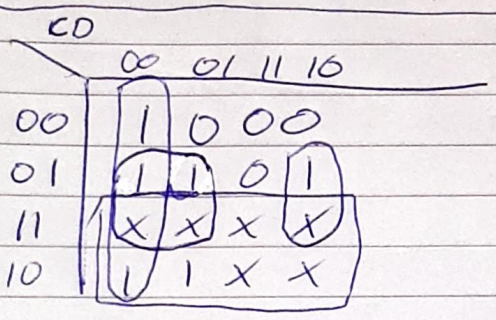


ii.

Decimal	A	B	C	D	a	f
0	0	0	0	0	1	1
1	0	0	0	1	0	0
2	0	0	1	0	1	0
3	0	0	1	1	1	0
4	0	1	0	0	0	1
5	0	1	0	1	1	1
6	0	1	1	0	1	1
7	0	1	1	1	1	0
8	1	0	0	0	1	1
9	1	0	0	1	1	1
10	1	0	1	0	X	X
11	1	0	1	1	X	X
12	1	1	0	0	X	X
13	1	1	0	1	X	X
14	1	1	1	0	X	X
15	1	1	1	1	X	X

a)

iii. ~~0000~~ ~~0000~~ ABCD 0010 should have a "1" in it in the Karnaugh map to represent a. In the Karnaugh map there is a "0" at 0010, so it represents f.



group 1

~~AB~~ 0000
0100
0100
$\bar{C}\bar{D}$

group 3

0110
0110
$BC\bar{D}$

group 2

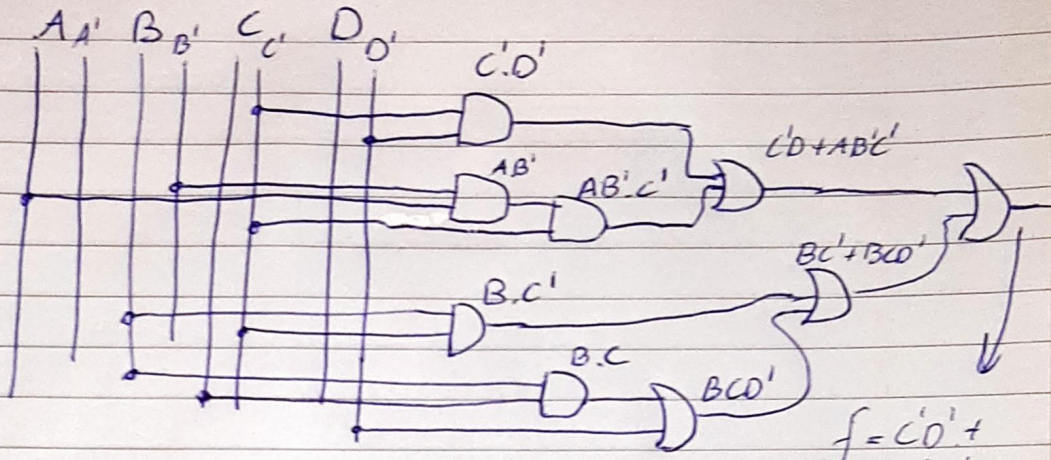
1000
1001
$A\bar{B}\bar{C}$

group 3

~~00~~ 1000
1010
1001
1011
$B\bar{C}$

$f = C'.D' + A.B'.C' + B.C' + B.C.D'$

iv.



b). 212356277

÷2 = 106183 8 +1
÷2 = 530919 +0
÷2 = 265459 +1
÷2 = 132729 +1
÷2 = 66364 +1
÷2 = 33182 +0
÷2 = 16591 +0
÷2 = 8295 +1
÷2 = 4147 +1
÷2 = 2073 +1
÷2 = 1036 +1
÷2 = 518 +0
÷2 = 259 +0
÷2 = 129 +1
÷2 = 64 +1
÷2 = 32 +0
÷2 = 16 +0
÷2 = 8 +0
÷2 = 4 +0
÷2 = 2 +0
÷2 = 1 +1

answer: 10000
0110011
11001101

c).