NAME: NDIFE NZUBECHUKWU KINGSLEY

MATRIC NUMBER: 15/ENG05/014

Course: MCT 510

DEPARTMENT: MECHATRONICS ENGINEERING

DATE: 3-06-2020

ASSIGNMENT 4:

1. Draw the circuit of a single phase half wave diode rectification feeding a resistive load. Neglect the forward resistance Rf of the diode and given that the input voltage is VmSinաt with a load resistance R. find the following
2. DC output current
3. Dc output voltage
4. Rms output current (Irms)
5. Vrms
6. Pdc
7. Pac
8. Efficiency
9. Form factor
10. Ripple factor
11. Transformer utilization Factor

 Solution





Parameters

Vm= 230 v, RT = R + RF = 10 +50 =60Ω,

1. Idc

= --------------- 1

But , -------------------------------- 2

From V = IR, I = Vm/R ----------------------- 3

Substitute Equations 2 and 3 into 1

 ----------------------------- 4

 Integrating equation 4

 = -------------------- 5

But π = 180

Substituting the value of π into equation 5

=

 Substituting the values of Vm and R

= =

1. Vdc

Vdc= Idc \* R -------------------- 1

But Idc = --------------------- 2

Substitute the value of Idc -------- 1

 = 35 .01

1. Irms

= ---------------------- 1

But , I = V/R --------------------------- 2

Substitute equation 2 into 1

 ------------------- 3

 Integrating equation 3

 From trigonometry ------------- 4

 Irms = ------- 5

 =

 =

 =

 = Irms = = = 0.9166 A

1. Vrms

Vrms = Irms \* R

 From (iii), the value of Irms = 0.9166 A

 0.9166 \* 60 = 54.996 volts

1. Pdc = Vdc \* Idc

 = 20.4283 w

1. Pac

=

= 50.4166 w

1. Efficiency

= = = 0.405 \* 100 = 40.5%

1. Form Factor

= = = 1.571

1. Ripple Factor

= =

1. TUF

=

 = = 0.28

1. Relationship between Ripple factor and Form Factor

Show that Ripple Factor =

 Solution

 Form Factor = --------------------- 1

 But

 Vrms = Irms \* R ------------------------------ 2

 Vdc = Idc \* R --------------------------- 3

 Substitute Equations 2 and 3 into 1.

 ---------------------------- 4

 Equation (4) expresses Form Factor = ----------------------------- 5

 Ripple Factor (RF) is given as ------------------- 6

 Where Iac is the rms value of A.C component and Idc is the value of DC

 Component

 Irms = ------------------------------------ 7

 Equation 7 can be re written as ------------------- 8

 Substitute Equation 8 into Equation 6 and squaring equation 6 to balance

 both sides

 ----------------- 9

 Simplifying Equation 9

 ------------------ Equation 10

 Recall Form Factor = from Equation 5

 Substitute form factor into Equation 10

 ------------------------ 11

 Simplifying the Left hand side of equation 11