

Sekolah Pendidikan Profesional dan Pendidikan Berterusan (SPACE)

JABATAN KEJURUTERAAN ELEKTRIK PUSAT PENGAJIAN DIPLOMA (PPD), SPACE UNIVERSITI TEKNOLOGI MALAYSIA KUALA LUMPUR

DDWE 3711 ELECTRICAL ENGINEERING LABORATORY

(INDUSTRIAL ELECTRONICS)

EXPERIMENT 1 VOLTAGE REGULATOR

OBJECTIVE:

To study the performance of a simple series regulator, an improved series regulator, a shunt regulator and the IC regulator.

List of Equipment and Components

Equipment:

DC power supply Digital / Analog Multimeter Proto Board

Components:

2N3055	-	Power Transistor
741	-	Operational Amplifier
BZX 8 V	-	Zener Diode
7805	-	IC Regulator
Resistors	-	10 Ω (1), 100 Ω (1), 22 Ω (1), 47 Ω (1),
		390 Ω (1), 1 k Ω (2), 2 k Ω (1) and 20 k Ω (1)



PART A: To Study the Performance of a Simple Series Regulator



- 1. Measure and record the resistor values in Table 1(a).
- 2. Calculate the output voltage of the circuit in Figure 1 and record in Table 1(b).
- 3. Connect the circuit as in Figure 1.
- 4. Set V_{in} = 10 V. Measure and record the output voltage V_0 .
- 5. Increase V_{in} in steps of 1 V up to 16 V. Measure and record the output voltage $V_{0.}$
- 6. Record the output voltages in Table 1(b).

PART B: To study the Performance of an Improved Series Regulator.





- 1. Measure and record the resistor values in Table 2(a).
- 2. Calculate the regulated output voltage of Figure 2 and record in Table 2(b).
- 3. Connect the circuit as in Figure 2.
- 4. Set V_{in} = 10 V. Measure and record the output voltage V_0 .
- 5. Increase V_{in} from 10 V to 22 V, in steps of 2 V. Measure and record the output voltage V_0 .
- 6. Record the output voltages in Table 2(b).

PART C: To study the Performance of a Shunt Regulator.



- 1. Measure and record the resistor values in Table 3(a).
- 2. Calculate the regulated output voltage of Figure 3 and record in Table 3(b).
- 3. Connect the circuit as in Figure 3.
- 4. Set V_{in} = 18 V. Measure and record the output voltage V_0 .
- 5. Increase $V_{\rm in}$ from 18 V to 30 V, in steps of 2 V. Measure and record the output voltage $V_{\rm O}.$
- 6. Record the output voltages in Table 3(b).



PART D: To study the performance of a 7805 1C regulator.

Figure 4

- 1. Connect the circuit as in Figure 4.
- 2. Set the input voltage to 10 V. Measure and record the load voltage, V_0 and load current, l_L in Table 4(a) for resistors value 100 Ω , 47 Ω , 22 Ω and 10 Ω .
- 3. With a constant $R_L = 100 \Omega$. Vary the input voltage, 10 V, 12 V, 15 V and 20 V. Measure and record the load voltage, V_0 and current, l_L in Table 4(b).



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DDWE 3711 ELECTRICAL ENGINEERING LABORATORY (INDUSTRIAL ELECTRONICS)

REPORT SHEET 1 VOLTAGE REGULATOR

	1.
Group members Lecturer	2.
	3.
Lecturer	:
Date	•

No.	PO	СО	Student marks	Marks
1	PLO1	CLO5		50%
2	PLO2	CLO5		30%
3	PLO4	CLO5		10%
4	PLO8	CLO5		10%
Т	otal marks	•		100%

EXPERIMENT 1: VOLTAGE REGULATOR

PART A

Resistor	Listed value (kΩ)	Measured value (k Ω)
R_1	1	
R _L	20	

Table 1(a)

PO1 CO5 /1m

V _{in}	10 V	11 V	12 V	13 V	14 V	15 V	16 V
V ₀ (Calculated)							
V _O (Measured)							

Table 1(b)

PO1 CO5 / 6 m

PART B

Resistor	Listed value (k Ω)	Measured value (k Ω)
R ₁	1	
R_2	2	
R ₃	1	
R _L	20	

Table 2(a)

PO1 CO5 / 2 m

V _{in}	10 V	12 V	14 V	16 V	18 V	20 V	22 V
V ₀ (Calculated)							
V _O (Measured)							

Table 2(b)



Update: Jun 2018 (Marizan)

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PART C

Resistor	Listed value (kΩ)	Measured value (k Ω)
R ₁	2	
R_2	1	
R ₃	1	
R ₄	0.39	
R _L	20	

Table 3(a)

PO1 CO5 / 2 m

CO5

/6 m

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V ₀ (Calculated)	22 V 24 V 26 V 28 V 30 V	22 \	20 V	18 V	V _{in}
					V ₀ (Calculated)
V ₀ (Measured)					V _O (Measured)

PO1

Table 3(b)

PART D

R _L (Ω)	V _O (Volts)	I _L (mA)	
100			
47			
22			
10			

Table 4(a)

PO1 CO5 / 3 m

V _{in} (V)	V _O (Volts)	I _L (i	mA)		
10					
12					
15					
20					
	Table 4(b)	PO1	CO5		. /3

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DISCUSSIONS AND CONCLUSIONS

1. Using the results obtained in Part A, Part B and Part C, plot the graph of V_0 against V_{in} . Obtained the slope of the graphs. What can be concluded from the slope of the graph?

	DO1	COL	117
	PUI	0.05	 112

2. Using the values obtained in Part D, determine the output resistance and the line regulation of the 7805 regulator. Compare with the values obtained from the data sheet and state the observations.



PO1	CO5	 /4 m

3. From the results obtained, conclude the performance of the different regulators.

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PO1	CO5	 / 5 m

DDWE 3711 Electrical Engineering Laboratory Industrial Electronics Report Sheet 1: Voltage Regulator



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DDWE 3711 Electrical Engineering Laboratory Industrial Electronics Report Sheet 1: Voltage Regulator



DDWE 3711 Electrical Engineering Laboratory Industrial Electronics Report Sheet 1: Voltage Regulator



PLO2 (Psychomotor/Hands on Skill)

Criteria	Very poor (5 Marks)	Poor (10 Marks)	Moderate (15 Marks)	Good (20 Marks)	Excellent (25 Marks)
Ability to perform lab works based on the manual/ guidelines provided	Not at all	Quite Limited /Selectively	Can perform lab work moderately but require a lot of guidance	Can perform lab work systematically and only need minor guidance	Demonstrate systematic and excellent performances
Ability to perform simple lab work without supervision	Need full supervision	Major supervision	Minor supervision	Limited supervision	Work independently With no supervision
Ability to carry out lab work efficiently on the following criteria, (circuit assembly, using measurement apparatus and techniques)	Not able to construct a full circuit, poor/inaccurate measurement techniques/usage of equipment	Completed full circuit but poor/inaccurate measurement techniques/usage of equipment	Completed full circuit and it works successfully. However the measurement techniques/usage of equipment had some minor deficiency	Completed full circuit and it works successfully. However the measurement techniques/usage of equipment had produced a few errors/corrections.	Circuit was completed and works properly without any errors /corrections. Also demonstrated an excellent skills/conducts.
Ability to collect the required data, performs appropriate analysis and/or troubleshooting (if necessary).	Not able to collect data and/or perform analysis	Limited data collection but not able to perform analysis/ troubleshooting	Demonstrates major errors in data collection and /or analysis. Limited ability in troubleshooting	Minor error in data collection and analysis. Good approach/techniques in troubleshooting.	Data collection and data analysis are done systematically and performs excellent approaches to trouble shoot (if necessary)

PLO4 for Laboratory Report

Criteria	VERY POOR (5)	POOR (10)	MODERATE (15)	GOOD (20)	EXCELLENT (25)
Data Collection	No data reported.	Data is brief and missing significant pieces of information	Incomplete these of components of data (Both tables and Graphs): •Tables •Graphs	Only one component of data is incomplete (either table or graph). • Tables/Graph s	 Data is completed properly and attributes mentioned below are observed with great care: Tables are easy to read and units are provided. Graphs are labeled and shown trends.
Completing/ Answering Questions	Questions are not answered at all.	Attempts were made but gave wrong answer to every question.	Questions are answered without any depth and with many errors.	Questions are properly answered but with a few errors.	Questions are answered completely and correctly.
Summary/ Conclusion	No conclusion or summary is/are drawn/reported	Conclusion is too brief without any reference to important pieces of information	Any two components of the conclusion/summar y (mentioned) are missing : • Summary • Data • Hypothesis • Errors	Any component of the conclusion /Summary (mentioned) is missing: • Summary • Data • Hypothesis • Errors	 Conclusion /Summary of these attributes below were addressed/reported properly, clearly and systematically. experiment, data cited hypothesis/assumption s made The source of errors.
Report Quality	No attention to detail evident.	Report contains many errors.	Report is good but with few spelling or grammatical errors.	Report is well written and cohesive, with a few errors	Report is very well written without any spelling or grammatical mistakes.

<u>PL08</u>

Criteria	Very poor (5 Marks)	Poor (10 Marks)	Moderate (15 Marks)	Good (20 Marks)	Excellent (25 Marks)
Professional Practice (Punctuality/Follow the Rules)	Non- Conforming/ Not punctual	Not always Conforming/ Not always punctual	Sometimes Conforming/ Sometimes punctual	Conforming /Punctual	Always Conforming /Always Punctual
Ethical Conduct/Behaviour (Trustworthy / Respectfulness)	Does not practice	Not always practicing	Sometimes only	Mostly practicing	Always practicing
Social Cultural (Racial Harmony)	Does not observe	Not always observe	Sometimes observe	Mostly observe	Always observe
Personality	Mostly unpleasant	Not always pleasant	Moderately pleasant	Mostly pleasant	Always pleasant