



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
SEPTEMBER 2014 SESSION

SUBJECT CODE	:	FLD10103
SUBJECT TITLE	:	ANALOG ELECTRONICS
LEVEL	:	DIPLOMA
TIME / DURATION	:	3.30 PM – 6.00 PM (2.5 HOURS)
DATE	:	8 JANUARY 2015

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper **CAREFULLY**.
 2. This question paper is printed on both sides of the paper.
 3. Please write your answers on the answer booklet provided.
 4. Answers should be written in blue or black ink except for sketching, graphic and illustration.
 5. This question paper consists of **TWO (2)** sections. Section A and B. Answer all questions in Section A. For Section B, answer two (2) questions only.
 6. Answer all questions in English.
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THERE ARE 6 PAGES OF QUESTIONS, EXCLUDING THIS PAGE AND APPENDIX.

SECTION A (Total: 60 marks)**INSTRUCTION: Answer ALL questions.****Please use the answer booklet provided.****Question 1**

(a) Define the following terms:

(i) Intrinsic material (1 mark)

(ii) Extrinsic material (1 mark)

(b) Briefly explain with a help of drawing, the PN-junction diode under the following conditions:

(i) Forward bias (4 marks)

(ii) Reverse bias (4 marks)

(c) For the circuit in **Figure 1** below, determine:

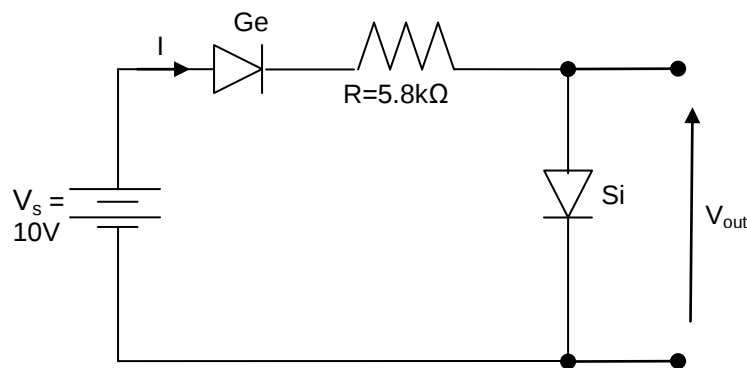


Figure 1

(i) The current, I (7 marks)

(ii) The output voltage, V_{out} (3 marks)

Question 2

- (a) Name four (4) groups of circuit that form a basic linear DC power supply.

(2 marks)

- (b) By referring to the **Figure 2** below, answer the following questions:

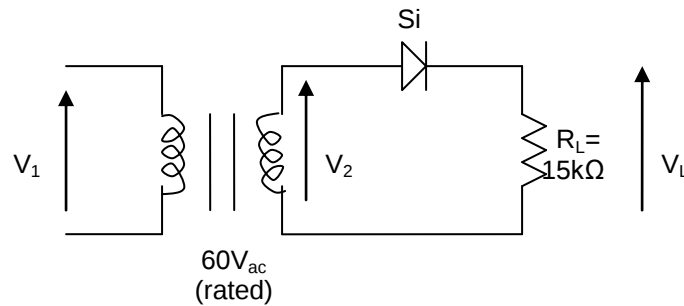


Figure 2

- (i) Explain the operation of the above rectifier circuit. (4 marks)

- (ii) Draw the ideal input/output waveform of the rectifier, V_2 and V_L .

(2 marks)

- (iii) Calculate average load voltage (V_{Lavg}).

(4 marks)

- (c) A primary voltage, V_1 of a transformer for a positive full-wave bridge rectifier is $180V_{RMS}$. The transformer used has a turns ratio $N_1 : N_2 = 4 : 2$ and a load resistance of $10k\Omega$. (Diodes are germanium type).

- (i) Draw the complete rectifier circuit.

(2 marks)

- (ii) Calculate the peak load voltage (V_{Lp}) and average load current (I_{Lavg}).

(6 marks)

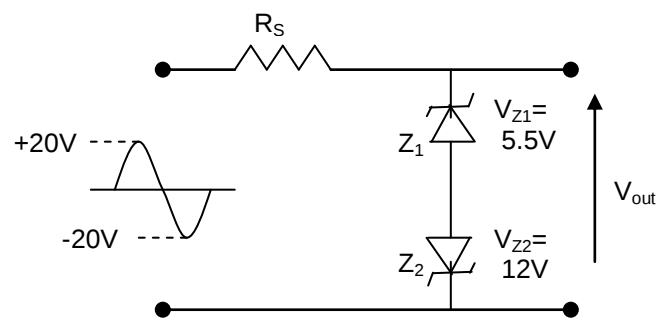
Question 3

- (a) Give two (2) types of zener regulation. (2 marks)
- (b) State the condition to be respected for zener diode maintains its regulation. (2 marks)
- (c) A certain zener diode has a maximum power rating of 600mW at 50°C and a de-rating factor of 4.4mW/C°. Determine the maximum power that can be dissipated at a temperature of 80°C. (4 marks)
- (d) By referring to the data sheet attached in **Appendix**, determine each of the following parameters value for zener diode 1N4737A.
- (i) maximum DC Power Dissipation (P_D) (2 marks)
 - (ii) nominal Zener Voltage (V_Z) (2 marks)
 - (iii) maximum zener current (I_{ZM}) (4 marks)
 - (iv) zener Knee Current (I_{ZK}) (2 marks)
 - (v) maximum Zener Impedance at Test current (Z_Z) (2 marks)

SECTION B (Total: 40 marks)**INSTRUCTION: Answer TWO (2) questions only.****Question 4**

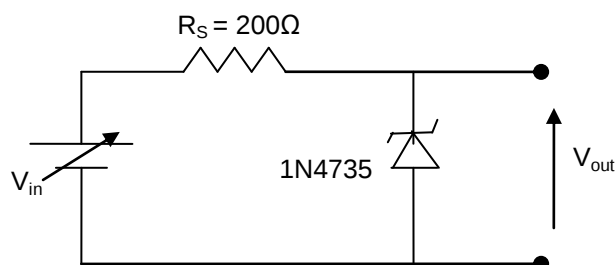
- (a) By considering ideal zener diode, determine and sketch the output voltage for the following zener limiting circuit in **Figure 3** below. (Zener diodes are silicon type).

(8 marks)

**Figure 3**

- (b) By considering ideal zener diode, determine the minimum and maximum input voltages that can be regulated by the zener diode in **Figure 4** below.

(12 marks)

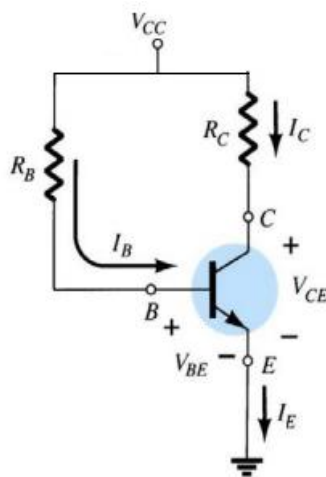


1N4735 Parameters:
 $V_Z = 6V$ at $I_{ZT} = 20mA$
 $I_{ZK} = 2mA$
 $P_D = 1W$ at $T_L = 50^\circ C$

Figure 4

Question 5

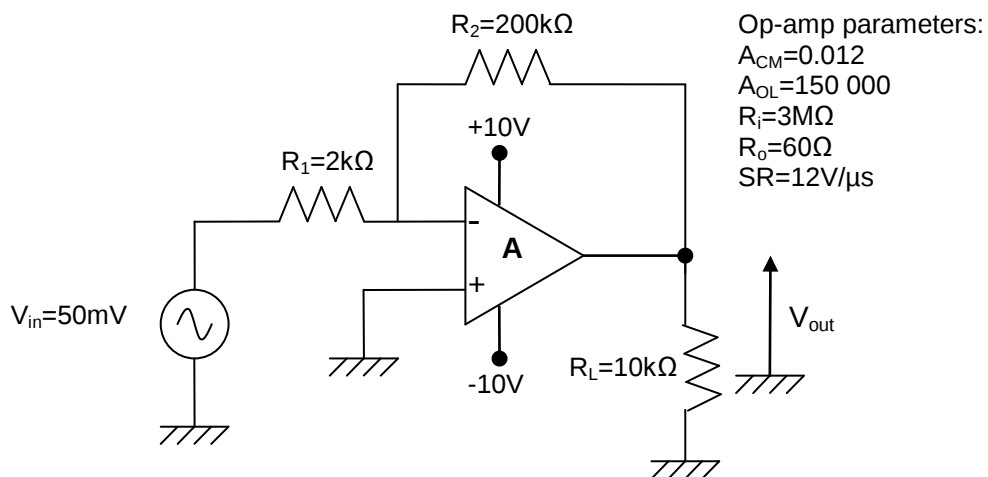
- (a) List the two (2) basic types of transistor. (2 marks)
- (b) Draw symbols of PNP and NPN transistor. Show their terminals and currents with direction. (4 marks)
- (c) For the transistor circuit shown in **Figure 5** below, given $R_C = 2.2 \text{ k}\Omega$, $I_B = 20 \text{ }\mu\text{A}$, $I_E = 4 \text{ mA}$ and $V_{CE} = 7.2 \text{ V}$. The transistor is based on silicon. Determine:

**Figure 5**

- (i) Collector current, I_C (3 marks)
- (ii) Current gain, β (3 marks)
- (iii) Base-Emitter voltage, V_{BE} (2 marks)
- (iv) Biasing voltage, V_{CC} (3 marks)
- (v) Base resistor, R_B (3 marks)

Question 6

- (a) (i) List out three (3) main characteristics of ideal op-amp. (3 marks)
- (ii) With a help of drawing, explain the three (3) basic input modes for op-amp. (6 marks)
- (b) Refer to **Figure 6** and answer the following questions.
- (i) Identify the amplifier. (1 mark)
- (ii) Determine the closed-loop gain, A_{CL} . (3 marks)
- (iii) Calculate the output voltage, V_{out} . (3 marks)
- (iv) Sketch the input voltage, V_{in} and output voltage, V_{out} on the same curve. (4 marks)

**Figure 6****END OF QUESTION PAPER**

APPENDIX



January 2005

1N4728A - 1N4764A

Zeners



DO-41 Glass case
COLOR BAND DENOTES CATHODE

Absolute Maximum Ratings * $T_a = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Value	Units
P_D	Power Dissipation @ $T_L \leq 50^\circ\text{C}$, Lead Length = 3/8"	1.0	W
	Derate above 50°C	6.67	mW/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-65 to +200	$^\circ\text{C}$

* These ratings are limiting values above which the serviceability of the diode may be impaired.

Electrical Characteristics $T_a = 25^\circ\text{C}$ unless otherwise noted

Device	V_Z (V) @ I_Z (Note 1)			Test Current I_Z (mA)	Max. Zener Impedance			Leakage Current	
	Min.	Typ.	Max.		Z_Z @ I_Z (Ω)	Z_{ZK} @ I_{ZK} (Ω)	I_{ZK} (mA)	I_R (μA)	V_R (V)
1N4728A	3.315	3.3	3.465	76	10	400	1	100	1
1N4729A	3.42	3.6	3.78	69	10	400	1	100	1
1N4730A	3.705	3.9	4.095	64	9	400	1	50	1
1N4731A	4.085	4.3	4.515	58	9	400	1	10	1
1N4732A	4.465	4.7	4.935	53	8	500	1	10	1
1N4733A	4.845	5.1	5.355	49	7	550	1	10	1
1N4734A	5.32	5.6	5.88	45	5	600	1	10	2
1N4735A	5.89	6.2	6.51	41	2	700	1	10	3
1N4736A	6.46	6.8	7.14	37	3.5	700	1	10	4
1N4737A	7.125	7.5	7.875	34	4	700	0.5	10	5
1N4738A	7.79	8.2	8.61	31	4.5	700	0.5	10	6
1N4739A	8.645	9.1	9.555	28	5	700	0.5	10	7
1N4740A	9.5	10	10.5	25	7	700	0.25	10	7.6
1N4741A	10.45	11	11.55	23	8	700	0.25	5	8.4
1N4742A	11.4	12	12.6	21	9	700	0.25	5	9.1
1N4743A	12.35	13	13.65	19	10	700	0.25	5	9.9
1N4744A	14.25	15	15.75	17	14	700	0.25	5	11.4
1N4745A	15.2	16	16.8	15.5	16	700	0.25	5	12.2
1N4746A	17.1	18	18.9	14	20	750	0.25	5	13.7
1N4747A	19	20	21	12.5	22	750	0.25	5	15.2

1N4728A - 1N4764A Zeners