



**UNIVERSITI KUALA LUMPUR
Malaysia France Institute**

**FINAL EXAMINATION
SEPTEMBER 2013 SESSION**

SUBJECT CODE : FLD 10103
SUBJECT TITLE : ANALOG ELECTRONICS
LEVEL : DIPLOMA
TIME / DURATION : 2.5 HOURS
DATE :

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 8 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

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

- (a) Define the doping process.

(2 marks)

- (b) Describe the difference between n-type and p-type semiconductor materials.

(3 marks)

- (c) Determine the current that will flow in the circuit of **Figure 1** below which uses two oppositely-connected diodes in parallel. Both diodes are germanium type.

(5 marks)

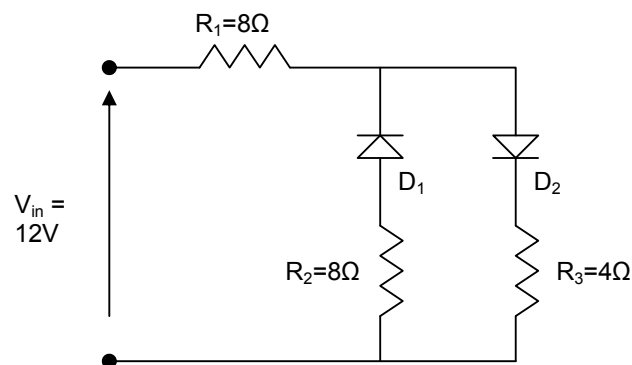


Figure 1

- (d) Draw I-V characteristic curve of transistor and indicate on the curve all operating regions for transistor.

(5 marks)

- (e) Determine the alpha rating for the transistor as shown in **Figure 2**. Then determine the value of I_C using both the alpha rating and the beta rating of the transistor.

(5 marks)

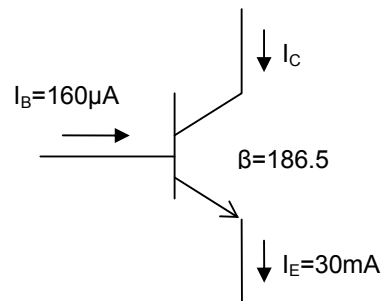


Figure 2

Question 2

(a) By referring to **Figure 3** below, answer the following questions:

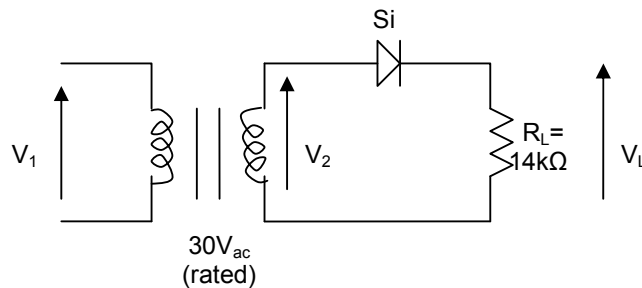
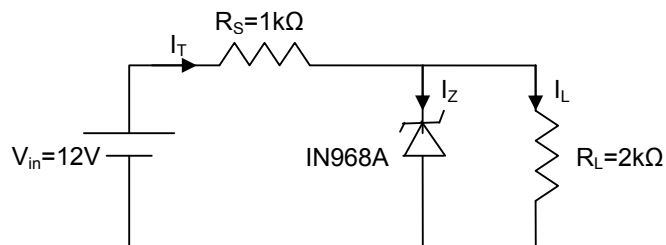


Figure 3

- (i) Explain the operation of the above rectifier circuit. (6 marks)
 - (ii) Sketch the waveform of V_2 and V_L . (4 marks)
 - (iii) Calculate average load voltage (V_{Lavg}). (4 marks)
- (b) A primary voltage (V_1) of a transformer for a positive full-wave bridge rectifier is 150V_{RMS} . The transformer used has a turns ratio $N_1 : N_2 = 4 : 1$ and a load resistance of $12\text{k}\Omega$. (Diodes are silicon type). Calculate:
- (i) the peak load voltage (V_{Lp}) (2 marks)
 - (ii) the average load voltage (V_{Lavg}) (2 marks)
 - (iii) the average load current (I_{Lavg}) (2 marks)

Question 3

- (a) By referring to the zener voltage regulator circuit as shown in **Figure 4**, calculate I_Z .
(Consider ideal zener diode). (16 marks)



IN968A Parameters:

$$V_Z = 4.2V$$

$$I_{ZK} = 0.2mA$$

$$I_{ZM} = 50mA$$

Figure 4

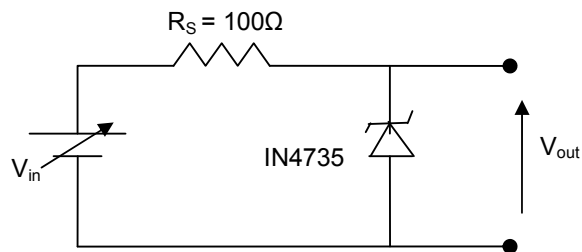
- (b) Determine whether zener diode IN968A used in circuit in **Figure 4** can maintain its regulation. Give your reason for your answer.

(4 marks)

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

Determine the minimum and maximum input voltages that can be regulated by the zener diode in **Figure 5** below. (Consider ideal zener diode).

(20 marks)



IN4735 Parameters:
 $V_Z = 10V$ at $I_{ZT} = 40mA$
 $I_{ZK} = 3mA$
 $P_D = 1W$ at $T_L = 50^\circ C$

Figure 5

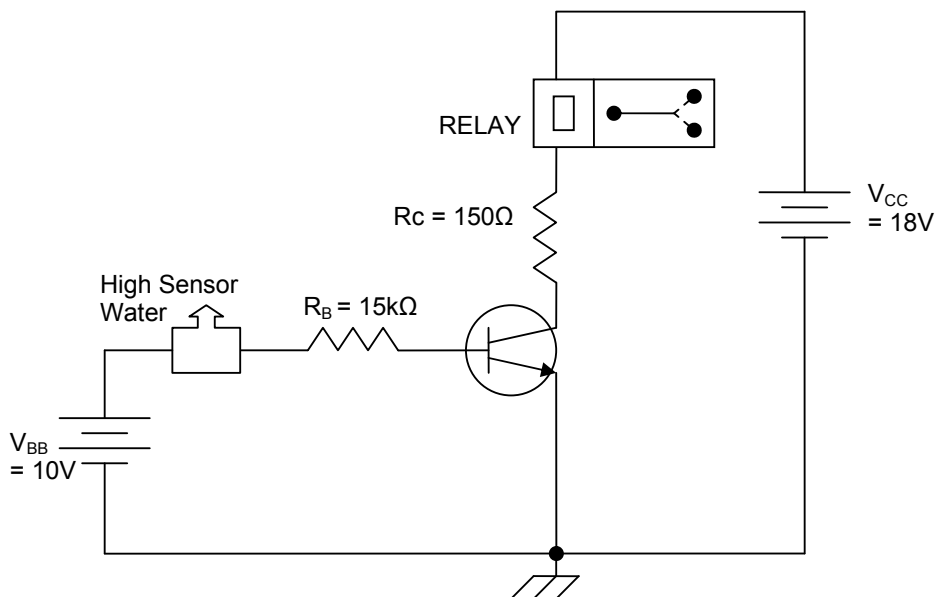
Question 5

- (a) Draw symbols of PNP and NPN transistor. Show their terminals and currents with direction.

(4 marks)

- (b) A high sensor water module in **Figure 6** below uses a bipolar junction transistor to make a relay 12V_{dc} energize and function. The operation of the circuit is as follows: When sensor detects water, switch is closed and the transistor will 'ON'. The relay then will be energized. Given $\beta = 100$, determine I_B , I_C , I_E , V_{BE} , V_{CE} and V_{CB} . (Transistor based on silicon)

(16 marks)

**Figure 6**

Question 6

- (a) (i) An opamp's IC can be identified by 7 character ID code. Distinguish the code by referring to **Table 1** below.

(4 marks)

Prefix	Designator	Suffix
TL	741C	P

Table 1

- (ii) There are two supply voltages for op-amp, labeled $+V_s$ and $-V_s$. Draw the three ways showing how the supply voltage can be connected.

(6 marks)

(b) Refer to **Figure 7** 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} . (2 marks)
- (iv) Sketch the input voltage, V_{in} and output voltage, V_{out} on the same curve. (4 marks)

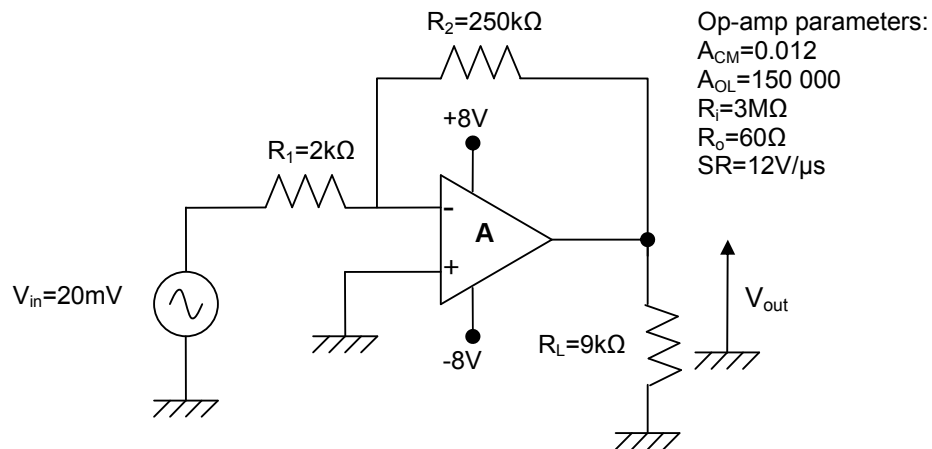


Figure 7

END OF QUESTION PAPER