UNIVERSITI KUALA LUMPUR

FINAL EXAMINATION

JANUARY 2016 SEMESTER

SUBJECT CODE	:	IED11102
SUBJECT TITLE	:	INTRODUCTION TO ELECTRONICS
LEVEL	:	DIPLOMA
TIME / DURATION	:	3.00 pm – 5.30 pm (2 ½ HOURS)
DATE	:	20 MAY 2016

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. This question paper consists of TWO (2) Sections. Section A and B.
4. Answer ALL questions in Section A. For Section B, answer TWO (2) questions only.
5. Please write your answers on the answer booklet provided.
6. Required formula is appended.
7. Answer all questions in English.

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) Materials can be classified into three groups. What are the three groups?

(3 marks)

(b) What is the difference between intrinsic and extrinsic semiconductors?

(4 marks)

(c) What is the difference between a pentavalent atom and a trivalent atom? What are other names for these atoms?

(4 marks)

(d) With the aid of diagrams, explain the difference between insulator, semiconductor and conductor in terms of its atomic structure. Give an example of each material.

(9 marks)

Question 2

(a) What is the barrier potential for a germanium diode?

(2 marks)

(b) What is the output voltage that you would expect to observe across R_L in the clamping circuit of Figure 1? Assume that RC is large enough to prevent significant capacitor discharge.

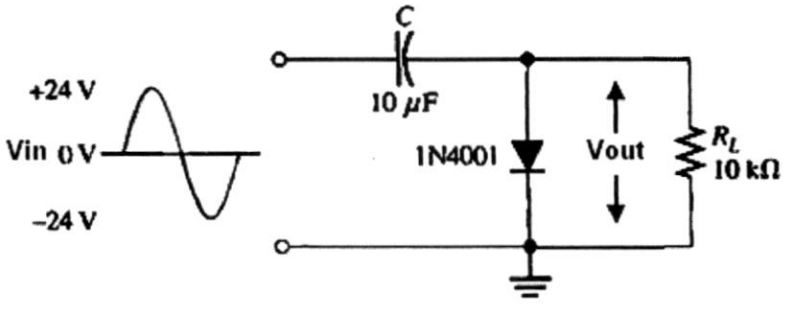

Figure 1

(4 marks)

(c) For the series diode configuration of Figure 2, determine V_D, V_R and I_D.

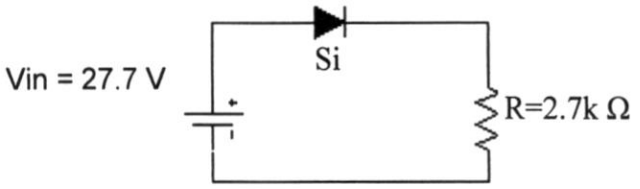

Figure 2

(6 marks)

(d) With the aid of diagrams, explain the operation of semiconductor diode under forward and reverse biased conditions.

(8 marks)

Question 3

(a) What is the main difference between BJT and FET?

(2 marks)

(b) What are the two main applications of BJT?

(2 marks)

(c) Determine the value of I_E and α_{dc} of a transistor, if I_C = 5.34mA and I_B = 475μA.

(4 marks)

(d) Calculate the value of β_{DC} for a transistor, if I_E = 20.5mA and I_C = 20.3mA.

(4 marks)

(e) In a certain transistor circuit, the base current is 2 percent of the 30mA emitter current. Determine the value of I_C, β_{dc} and α_{dc}.

(8 marks)

SECTION B (Total: 40 marks)

INSTRUCTION: Answer TWO (2) questions only.
Please use the answer booklet provided.

Question 4

(a) Determine the peak value of the output voltage for Figure 3 if the turns ratio is 0.5.

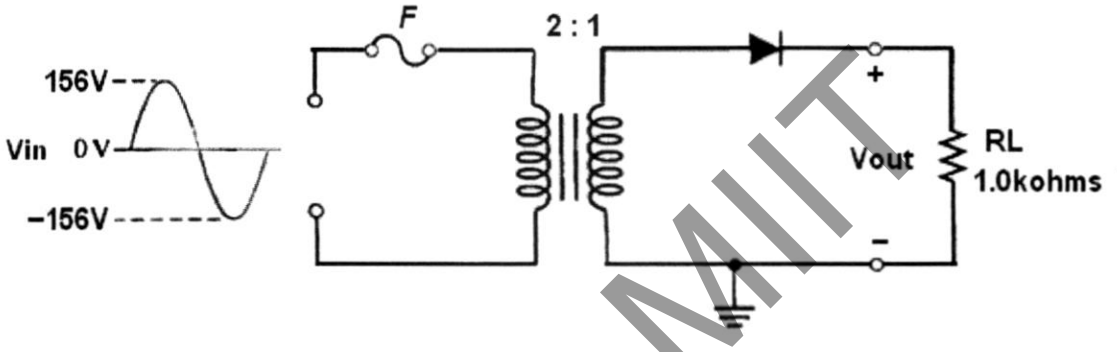

Figure 3

(4 marks)

(b) For the full-wave rectified voltage in Figure 4, determine;

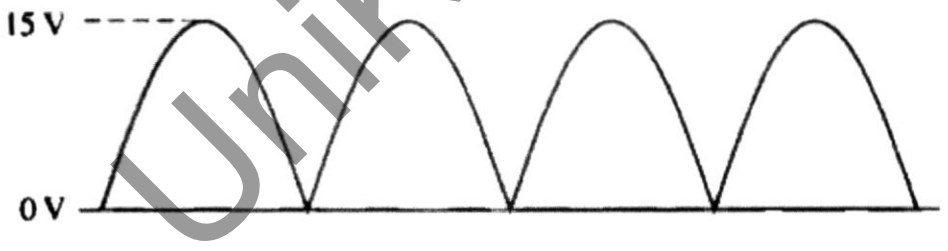

Figure 4

i. Peak Rectified Voltage, V_{PR}.

(2 marks)

ii. Average value, V_{avg}.

(2 marks)

ii. RMS value, V_{rms}

(2 marks)

(c) i. Show the voltage waveform across each half of the secondary winding and across RL when a 240V peak sine wave is applied to the primary winding in Figure 5.

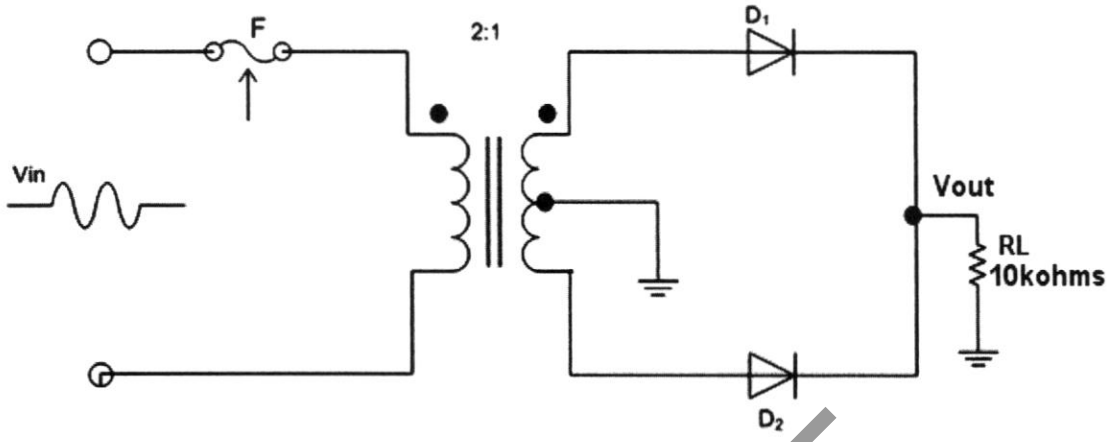

Figure 5

(8 marks)

ii. Calculate the minimum PIV rating for the diode.

(2 marks)

Question 5

(a) A certain amplifier exhibits an output power of 5W with an input power of 0.5W. Determine the value of power gain in dB.

(2 marks)

(b) If the output voltage of an amplifier is 1.2V rms and its voltage gain is 50, what is the rms input voltage? Calculate the value of voltage gain in dB.

(4 marks)

(c) Suppose that an amplifier has a voltage gain of 50, an input resistance of 1kΩ and an output resistance of 150Ω. Determine the value of A_V and A_P in dB?

(6 marks)

(d) For the circuit in Figure 6, given *re'* = 50Ω and β = 200.

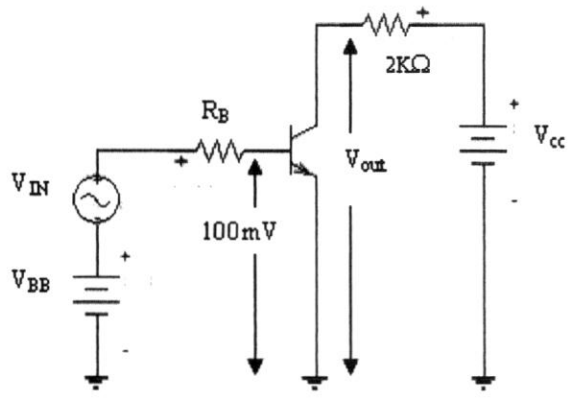

Figure 6

Determine;

i. The current gain (Ai)

(2 marks)

ii. The voltage gain (A_V)

(2 marks)

iii. The ac output voltage (V_{OUT})

(2 marks)

iv. The power gain (A_P) in dB

(2 marks)

Question 6

(a) A base current of 50μA is applied to the transistor in Figure 7, and a voltage of 5 V is dropped across Rc. Determine β_{DC} of the transistor.

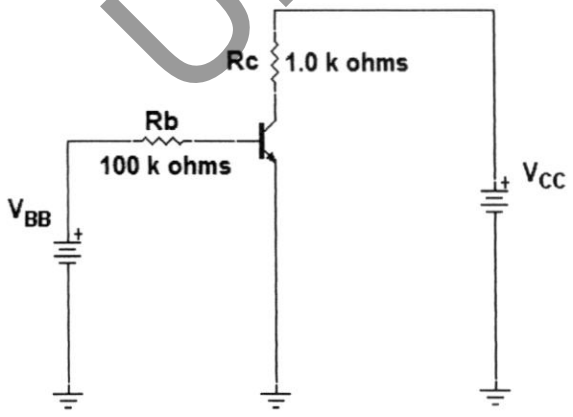

Figure 7

(6 marks)

(b) Design a biased-transistor circuit using V_{BB}= 10V and V_{CC}= 20V, for a Q point of I_B= 5mA and V_{CE}= 4V. Given β_{DC}= 100. The design should determine the R_B and R_C. Sketch the circuit.

(6 marks)

(c) For the transistor circuit in Figure 8, calculate I_B, I_C, I_E, V_{CE} where β_{dc}=80, V_B=2V and V_E=1.3V.

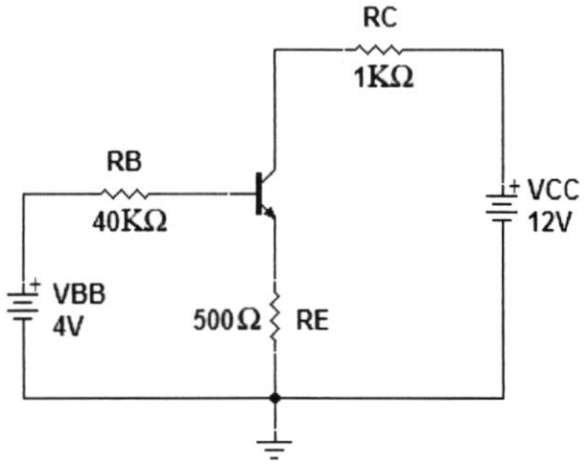

Figure 8

(8 marks)

END OF EXAMINATION PAPER

APPENDIX

Formula Sheet

1. $\beta = \frac{\alpha}{1-\alpha}$

2. $\alpha = \frac{\beta}{1+\beta}$

3. $I_E = I_B + I_C$

4. $I_C = \beta I_B$

5. $P = [V_{DC} - V_{load}]I_{out}$

6. $\theta_{JA(\max)} = \frac{J_{JA(\max)} - T_A}{P}$

7. $V_{rippleout(p-p)} = V_{ripplein(p-p)} x 10^{-[(dB-20\log V_{out})/20]}$

8. $V_B = \frac{R_{B2} x V_{CC}}{R_{B1} + R_{B2}}$

9. $V_E = V_B - 0.7$

10. $I_E = \frac{V_E}{R_E}$

11. $I_C \approx I_E$

12. $V_{RC} = I_C R_C$

13. $V_{CE} = V_{CC} - V_{RC} - V_E$

14. $V_C = V_{CC} - I_C R_C$