UNIVERSITI KUALA LUMPUR

Malaysian Institute Of Information Technology

FINAL EXAMINATION

JANUARY 2016 SEMESTER

SUBJECT CODE	:	IED12102
SUBJECT TITLE	:	ANALOGUE 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 7 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) What is the β_{DC} , if I_C is 50 times larger than I_B.

(2 marks)

(b) What is the α_{DC} if I_C=5.35mA and I_B=50uA?

(4 marks)

(c) In a certain transistor circuit, the base current is 2 percent of the 30 mA emitter current. Determine the collector current and β_{DC} .

(6 marks)

(d) With the aid of a diagram, explain the basic transistor operation.

(8 marks)

Question 2

(a) Determine I_B, I_E and I_C in Figure 1. α_{DC} = 0.98.

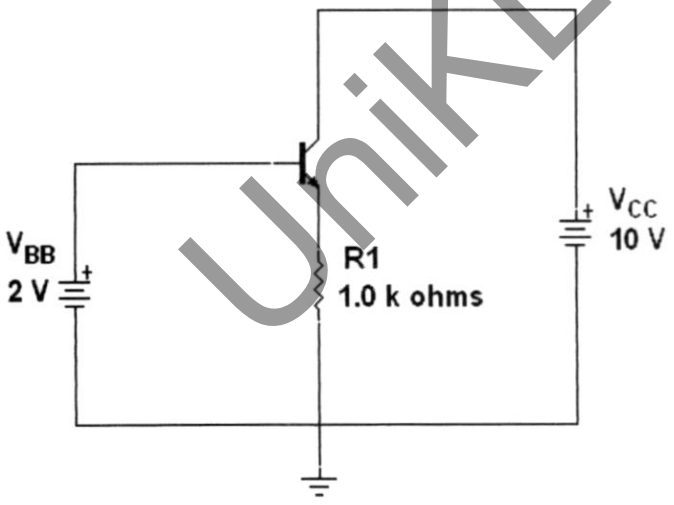

Figure 1

(8 marks)

(b) For the transistor circuit in Figure 2, calculate I_B, I_C, I_E, V_E, and V_{CE}. Plot the dc load line and label the Q point.

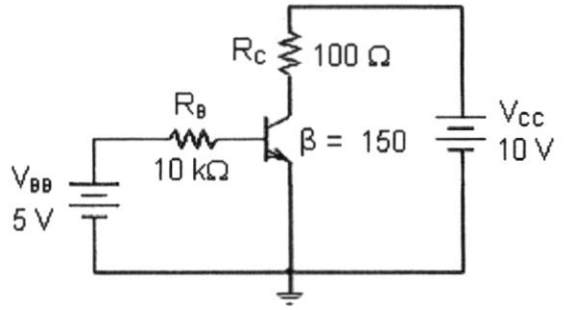

Figure 2

(12 marks)

Question 3

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

(2 marks)

(b) State the condition when $V_{CE} = V_{CC}$.

(2 marks)

(c) Determine whether or not the transistor in Figure 3 is in saturation. Assume $V_{CE(sat)} = 0.2$ V.

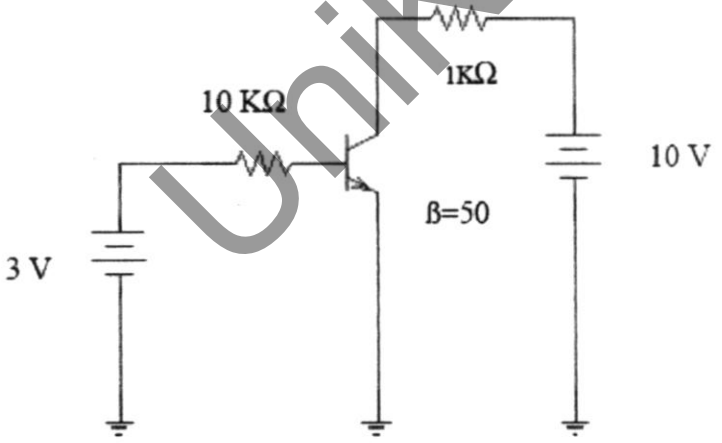

Figure 3

(8 marks)

(d) The LED in Figure 4 requires 30 mA to emit a sufficient level of light. Therefore, the collector current should be approximately 30 mA. For the following circuit values, determine the amplitude of the square wave input voltage necessary to make sure that the transistor saturates. Use double the minimum value of base current as a safety margin to ensure saturation. V_{CC}= 9 V, $V_{CE(sat)}$= 0.3 V, R_C= 220 Ω, R_B= 3.3 kΩ, β_{DC} = 50, and V_{LED} = 1.6V.

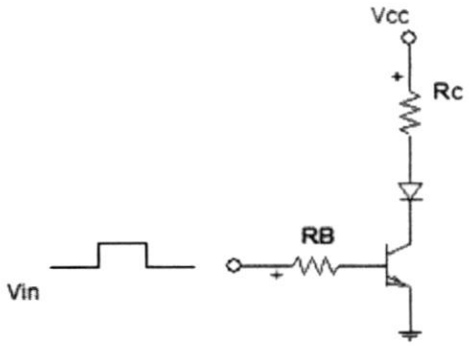

Figure 4

(8 marks)

SECTION B (Total: 40 marks)

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

Question 4

(a) For the voltage-divider bias circuit Figure 5, determine R_{th}, V_B, I_B, I_C, V_C , V_E and V_{CE}.

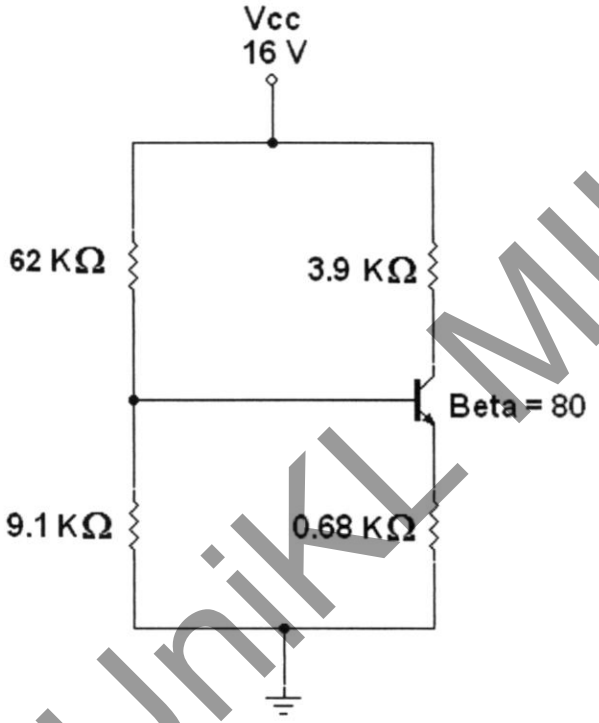

Figure 5

(10 marks)

(b) For the Collector-feedback bias circuit Figure 6, determine I_C, I_B, I_E, V_{CE}, and V_{CB}, if $\beta_{DC} = 100$.

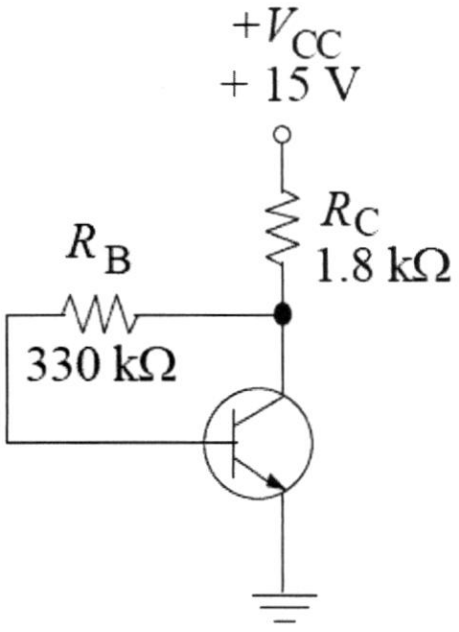

Figure 6

(10 marks)

Question 5

(a) Refer to the Op-Amp in Figure 7,if Vi=0.5 V, calculate:

i. The output voltage Vo, and

(2 marks)

ii. The current in the 10 k resistor.

(2 marks)

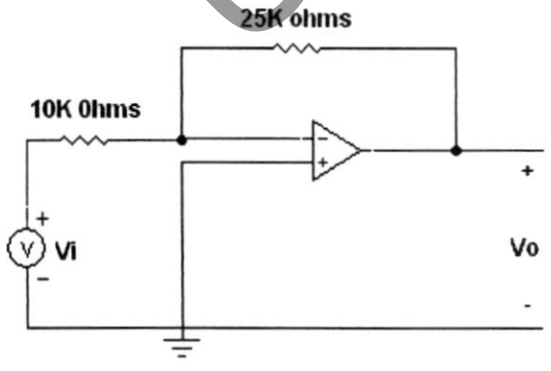

Figure 7

(b) Determine i_o and V_o in the circuit in Figure 8.

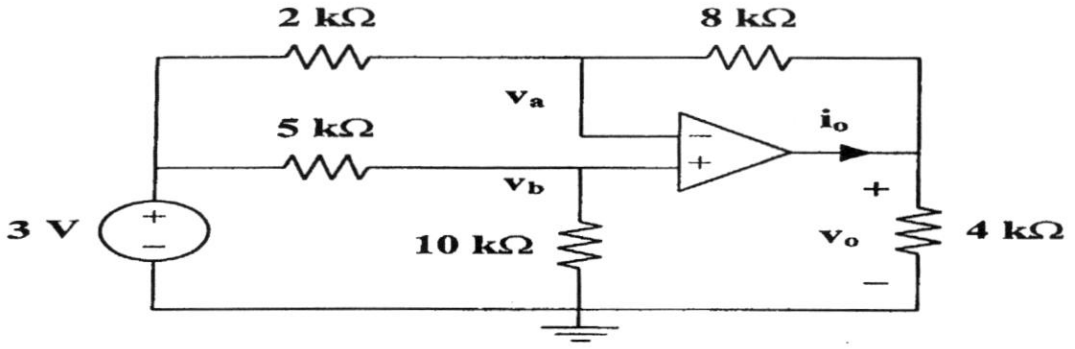

Figure 8

(8 marks)

(c) Determine V_o and i_o in the circuit in Figure 9.

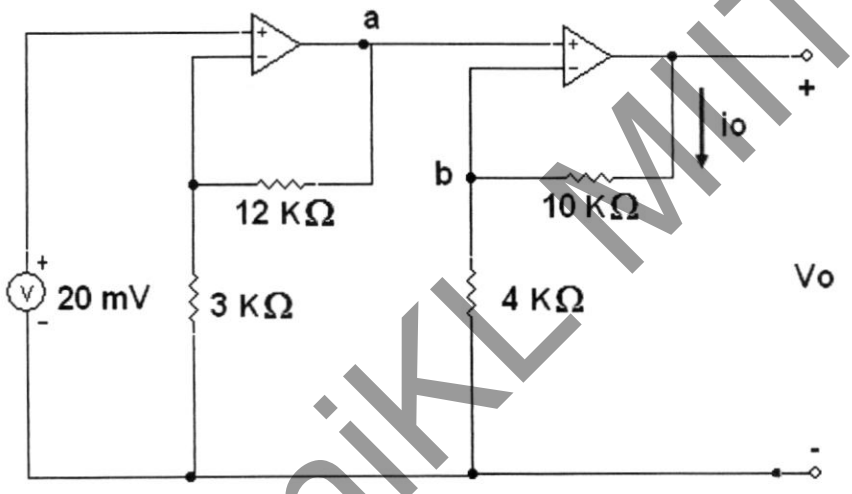

Figure 9

(8 marks)

Question 6

An amplifier circuit is given as in Figure 10. Assuming $X_{C1}=X_{C2}=X_{C3}=0$, and $\beta=188$. Determine the following.

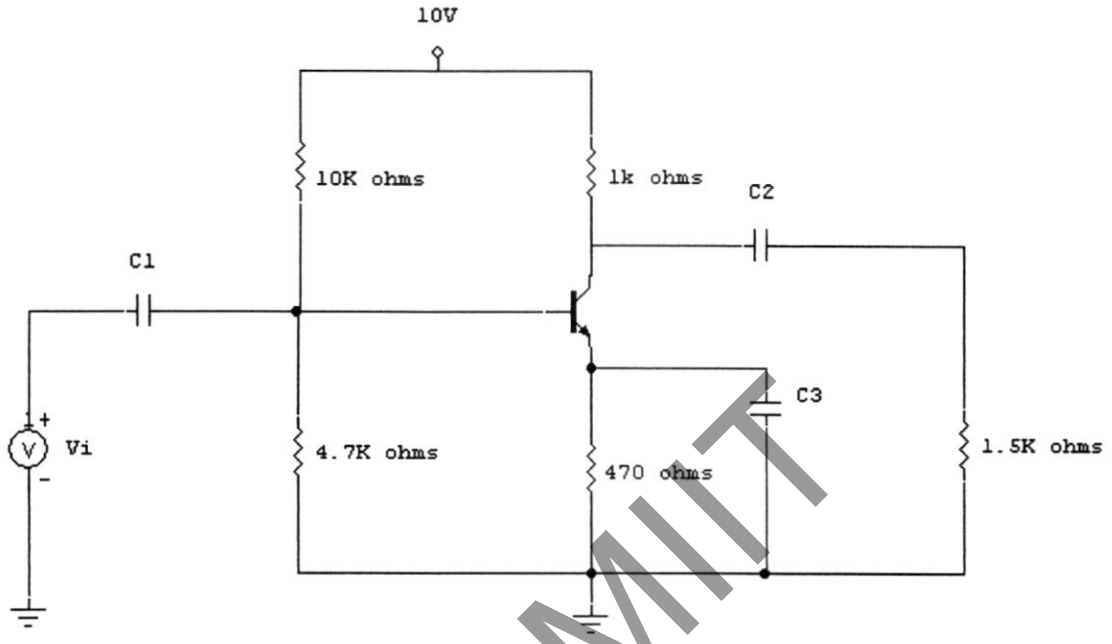

Figure 10

i. I_{CQ} and V_{CEQ}

(7 marks)

ii. I_C and V_{CE} at the point of saturation and cutoff for both DC & AC operation.

(8 marks)

iii. The AC and DC load lines

(2 marks)

iv. The Voltage Gain if r'e = 8 W

(1 mark)

v. Quiescent Power

(1 mark)

vi. AC Output Power

(1 mark)

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. $V_{rippleout(p-p)} = V_{ripplein(p-p)} x10^{-[(dB-20\log V_{out})/20]}$

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. $V_C = V_{CE} + V_E$

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