UNIVERSITI KUALA LUMPUR
Malaysian Institute of Marine Engineering Technology

FINAL EXAMINATION
JANUARY 2016 SESSION

SUBJECT CODE	:	LEB 10202
SUBJECT TITLE	:	MARINE ELECTRONICS
LEVEL	:	DEGREE
TIME / DURATION	:	9.00 AM – 11.00 AM / 2 HOURS
DATE	:	20 MAY 2016 / FRIDAY

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. Begin **EACH** answer on a new page in the Answer Booklet.
3. Where applicable, show clearly steps taken in arriving at the solutions and indicate **ALL** assumptions.
4. This question paper consists of 5 Questions. **Answer Four (4) Questions ONLY.**
5. Tables, Formulae and Charts are appended.
6. Answer all questions in English.

THERE ARE SEVEN (7) PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

INSTRUCTION: Answer only FOUR (4) questions.

Please use the answer booklet provided.

Question 1

a. Define the term series and parallel circuit. Provide the example of figure showing the series and parallel circuit respectively. (4 marks)

b. Figure 1 shows electrical circuit connection that need to be analysed. As an Electrical Engineer, calculate each item below. Given $R_1, R_2, R_3 = 2\Omega$ and $V_1 = 6V$. State the law applied. Show the current flow calculation by method of nodal analysis.

i. Current flow at each resistor (6 marks)

ii. Voltage across each resistor (3 marks)

iii. Power across each resistor (3 marks)

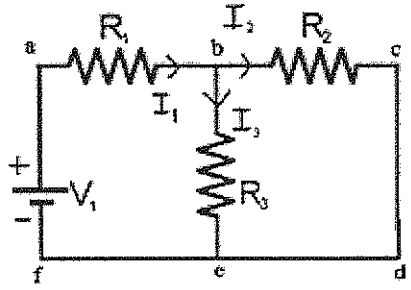

Figure 1

c. As a Marine Electrical Engineer, you are required to analyse the circuit in Figure 2 in order to rectify the sudden shutdown happened. Determine the value of V_1 and V_2 respectively. (7 marks)

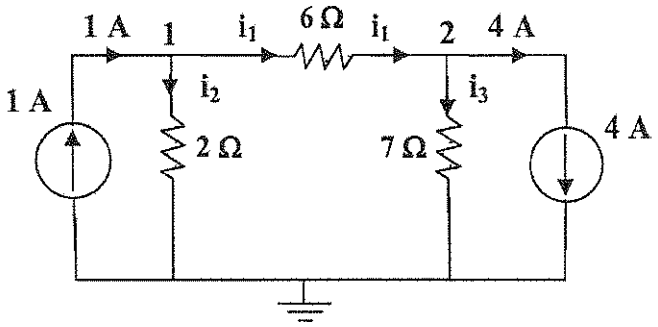

Figure 2

d. Calculate the reactance of inductor when connected to a series circuit with the inductor value is 25mH. Frequency used in the power supply is 2 Hz.

(2 marks)

Question 2

a. Sketch two types of transistor and its respective symbols. Define the functionality of transistor.

(4 marks)

b. Semiconductor materials consists of intrinsic and extrinsic categories. Briefly explain each category respectively.

(4 marks)

c. Figure 2.1 shows electrical circuit with npn transistor. Determine I_B, I_C, I_E, V_{BE}, V_{CE} and V_{CB}. The transistor have $\beta = 150$.

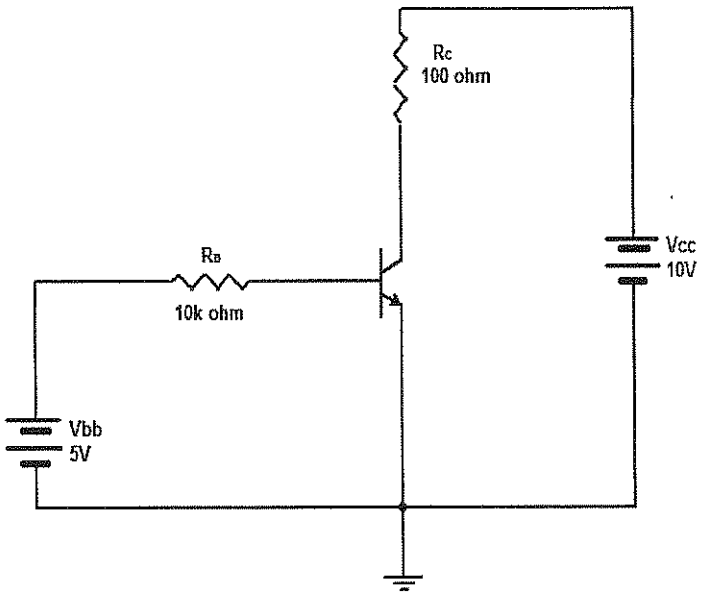

Figure 3

(12 marks)

d. As an Electronic Engineer, you are required to analyze the BJT circuit as shown in Figure 2.2. Given V_{CE}=0.2V in saturation. Calculate and determine

i. The saturation current (2 marks)

ii. The cutoff voltage (2 marks)

iii. Condition of the circuit. Is the transistor saturated or not? (1 mark)

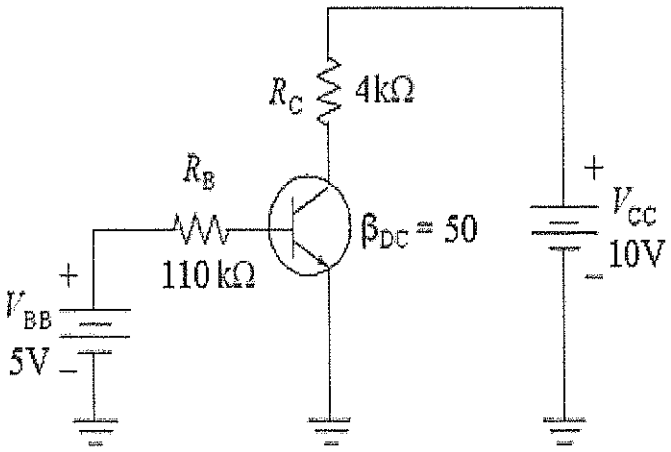

Figure 4

Question 3

a. Develop the truth table and logic symbol of NOR gate.

(4 marks)

b. Sketch the logic gate according to the respective Boolean equation as given.

$$WX\overline{Y} + \overline{W}X\overline{Y} + \overline{\overline{W}\overline{X}Y} = Z$$

(4 marks)

c. Solve the equation given by applying De Morgan's theorem and Boolean Algebra.

$$\overline{ABC + DEF}$$

(2 marks)

d. Simplify the Boolean equation below by using Karnaugh map and illustrate the logic gate circuit from the simplified equation.

$$X = ABC\bar{D} + AB\bar{C}D + A\bar{B}CD + ABCD$$

(7 marks)

e. Derive final output (Y) after applying Sum-of-Product (SOP) based on the truth table given in Table 1. Implement the logic gate circuit after applying Karnaugh map (K-Map) method.

Inputs			Output
A	B	C	Y
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	1

Table 1

(8 marks)

Question 4

a. State the purpose on the benefits of learning about space system.

(4 marks)

b. The orbit of satellite consists of three types which is Low Earth Orbit (LEO), Medium Earth Orbit (MEO) and Geostationary (GEO). Describe the advantages and disadvantages of each type.

(9 marks)

c. Explain how the satellite work.

(4 marks)

d. Other orbit in satellites communication is called High Altitude Platform (HAP). Briefly explained about this orbit.

(4 marks)

e. Explain the importance to learn about satellite. Provide the advantages of satellite communication over terrestrial communication.

(4 marks)

Question 5

a. Define hysteresis in comparator operation. Then, sketch the circuit containing the comparator with positive feedback.

(4 marks)

b. Describe the ideal integrator and comparator in operational amplifier. Illustrate its symbols.

(8 marks)

c. Define summing amplifier and illustrate a circuit depicted the summing amplifier. After that, you are required to analyse the circuit with respect to the condition given. Note that the input voltages given for summing amplifier are +5.67V, -3.52V and +4.28V. Using the input stated, determine V_{out} in below condition:

i. All resistor value is 14.8 kΩ (4 marks)

ii. $R_1 = R_2 = R_3 = 10k\Omega$ and $R_f = 3.3\ k\Omega$ (4 marks)

d. Averaging amplifier is also known as scaling adder. Based on Figure 5, determine the value of R_1, R_2 and R_3 if $R_f = 10\ k\Omega$. Input 1 and Input 2 requires a gain of -2 and Input 3 requires a gain of -3.

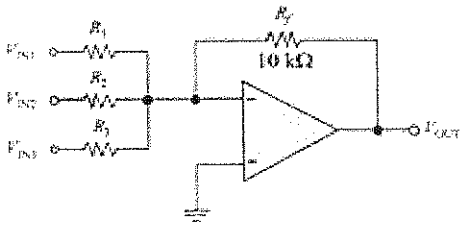

Figure 5

(5 marks)

END OF QUESTION