Uva Wellassa University of Sri Lanka
Faculty of Applied Sciences
Department of Science and Technology
400 level 1st Semester Examination – Jul./ Aug. 2019
SCT 366-1 Introduction to Mechatronics

Instructions to candidates:
Duration: Two (02) hours
Number of questions: Twelve (12) Structured Questions
Mark allocation: 100 mark
Answer all questions

A mechatronics engineer unites the principles of mechanics, electronics, and computing to generate a simpler, more economical, and reliable system. The term "mechatronics" was coined by Tetsuro Mori, the senior engineer of the Japanese company Yaskawa in 1969. An industrial robot is a prime example of a mechatronics system; it includes aspects of electronics, mechanics, and computing to do its day-to-day jobs.

1. Write a working definition for Mechatronics in your own words.

.....

.....

.....

.....

.....

.....

(10 mark)

2. Name and explain elements in a mechatronic system.

.....

.....

.....

.....

.....

.....

(08 mark)

3. List five examples for applications of mecharonics.

.....

.....

(1)

.....

.....

.....

(05 mark)

4. Briefly explain the difference between a **traditional engineering system** and **mechatronic** approach.

.....

.....

.....

.....

.....

.....

.....

.....

.....

(10 mark)

5. State the steps of reading a resistor value using the colour code.

.....

.....

.....

.....

.....

.....

.....

.....

(10 mark)

6. Illustrate the classification of resistors.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(08 mark)

7. What is an electronic oscillator? Name three types of oscillators.

.....

.....

.....

.....

.....

.....

.....

.....

(06 mark)

Consider the design of a security system for a house with two entrances, the front door, and the back door and three windows. The goal is to design a security system that can activate an alarm and turn on a light to if there is an intruder.

8. What are the **sensors** and **actuators** that can be used to achieve this task?

.....

.....

.....

.....

.....

.....

.....

.....

(06 mark)

9. Write an algorithm that can be used to program the microcontroller of the security system.

(12 mark)

10. Briefly describe the factors that should be considered in selecting components for the above system.

(10 mark)

11. Determine the possible range of resistance values for each of the following.

i. Resistor R1 with color bands: red, brown, yellow and gold.

.....

.....

.....

.....

(02 mark)

ii. Resistor R2 with color bands: black, violet, orange and silver.

.....

.....

.....

.....

(02 mark)

iii. The series combination of R1 and R2.

.....

.....

.....

.....

(03 mark)

iv. The parallel combination of R1 and R2.

.....

.....

.....

.....

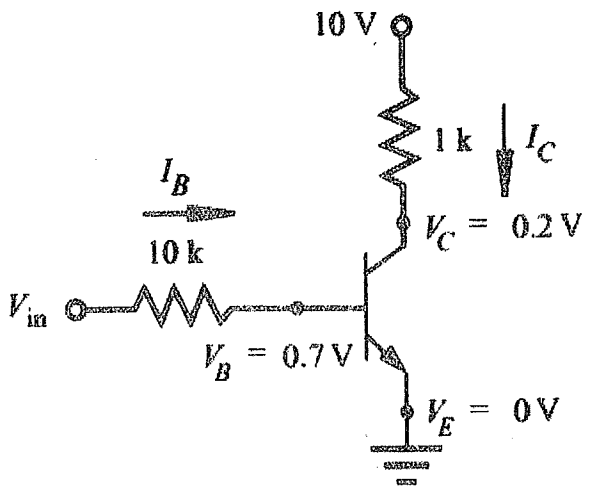
(03 mark)

P.T.O

12. **The 2N3904 is a small-signal transistor manufactured by many companies as a general purpose amplifier and switch. Following information are provided in a discrete transistor handbook:**

- **Maximum collector current (continuous) = 200 mA**
- **VCE (sat)= 0.2 V**
- **β = 100**

In the following circuit, what minimum input voltage V_{in} is necessary to saturate the transistor?



(05 mark)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....