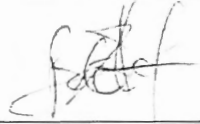




**FACULTY: ENGINEERING  
SECOND SEMESTER EXAMINATIONS  
2015/ 2016 ACADEMIC SESSION**


HOD'S SIGNATURE

**COURSE CODE: ATE 306  
COURSE TITLE: MECHATRONICS  
DURATION: 2 HOURS 30 MINUTES**

#### **INSTRUCTIONS**

1. ANSWER QUESTION (1) AND ANY OTHER THREE QUESTIONS
2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM
3. YOU ARE NOT ALLOWED TO BORROW CALCULATORS AND ANY OTHER WRITING MATERIALS

1. (a) Explain the Mode of operation of a Scanning Machine in relation to the Component and Items given in the Table below:

**Table 1. : Scanner (Discrete-Event System)**

Component	Items
Mechanical System	<ul style="list-style-type: none"> <li>• Scanning Head</li> <li>• Transport device</li> </ul>
Sensors	<ul style="list-style-type: none"> <li>• Scan sensors with cameras</li> </ul>
Controller	<ul style="list-style-type: none"> <li>• Controller Software process map of scanned documents</li> </ul>
User Interface	<ul style="list-style-type: none"> <li>• Scanned image sequences and transferred to PC using USB</li> </ul>
Drive Circuits	
Actuators	<ul style="list-style-type: none"> <li>• Transport device of Stepper motor and system of gears and belts to move scanning head</li> </ul>

**12 marks**

- (b) What is a Microcontroller

**3 marks**

2. (a) Define the terms (i) Mechanical Switches  
(ii) Thyristor and state its uses.

**5 marks**

- (b) Highlight the differences between a Thyristor and Transistor

**7 mark**

(c) In the Boolean algebra between A and B, complete the table in the Output and the Input

**Table 2**

INPUT		OUTPUT
A	B	A AND B
0	0	?
0	1	0
1	0	?
1	?	1

**3 marks**

3. (a) Define the following:

i. Kirchhoff's Voltage Law (KVL)

**3 marks**

ii. Kirchhoff's Current Law (KCL)

**3 marks**

(b) What is a Diode

**2 marks**

(c) Discuss the relationship between the following diodes:

i. Light Emitting Diode

**4 marks**

ii. Photodiodes

**3 marks**

4. (a) Write short notes on the following Sensors:

i. Linear and rotational sensors

ii. Acceleration sensors

iii. Force, torque and pressure sensors

iv. Flow sensors

v. Temperature measurements

vi. Ranging and proximity sensing

vii. Light detection, image and vision systems

viii. Fibre Optics devices

ix. Micro and nano-sensors

**9 marks**

(b) What are the Three (3) Key Elements of Mechatronics

**3½ marks**

(c) State any five (5) Actuators

**2½ marks**

5. (a) Outline

(i) three (3) Mechatronics Systems Objectives

(ii) three (2) Mechatronics Systems Advantages

(iii) two (2) Mechatronics Systems disadvantages

**7 marks**

(b) Briefly explain Mechatronic Systems in Vehicles in relation to

(i) Safety

(ii) Comfort

2 marks

(c) Define what is meant by:

(i) an analog circuit.

(ii) Digital circuit

(iii) Electric Circuit

6 marks

6. Use this Table 3 to answer question 6.

**Resistor Color Code Table**

Colour	Matinssa Value	Multiplier Value
Black	0	1
Brown	1	10
Red	2	100
Orange	3	1000
Yellow	4	10,000
Green	5	100,000
Blue	6	1,000,000
Violet	7	
Grey	8	
White	9	

Use the above table to calculate the value of the following resistors

(a) yellow, violet, orange

4 marks

(b) Red, Orange, yellow

4 marks

(c) Red, Violet, Green

4 marks

(4) Give detail explanation of what could have been responsible, when a button pressed on an handset is displaying another figure on the screen

3 marks