



MACHAKOS UNIVERSITY

University Examinations for 2019/2020 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (COMPUTER SCIENCE)

SCO 413: ROBOTICS

DATE: 22/10/2020

TIME: 2.00-4.00 PM

INSTRUCTIONS

Answer question ONE and any other TWO questions.

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) State FOUR (4) major issues of sensors in industrial robotics and other automated manufacturing systems. (4 marks)
- b) Explain THREE (3) basic components of a robot. (6 marks)
- c) State FOUR (4) phases of a robot development life cycle. (4 marks)
- d) Explain the difference between the **setup** and **loop** functions? (4 marks)
- e) State THREE (3) general considerations in Robot material handling? (3 marks)
- f) State THREE (3) robot programming languages. (3 marks)
- g) Write a sketch in Arduino that will calculate the volume of a sphere. $V = \frac{4}{3} * \pi r^3$ (6 marks)

QUESTION TWO (20 MARKS)

- a) State FOUR (4) benefits of robots in health. (4 marks)
- b) State FOUR (4) disadvantages of hydraulic grippers? (4 marks)
- c) How can a sketch control the duration of a 5 V signal? (4 marks)

- d) Write a setup function that makes the pin 13 servo turn full speed clockwise for 1.2 seconds, while the pin 12 servo stays still. After that, set both servos to stop. (8 marks)

QUESTION THREE (20 MARKS)

- a) State TWO (2) types of actuators that are used in robots? (2 marks)
- b) Robots find applications not only in the industry. Explain THREE (3) non-industrial applications of robots. (6 marks)
- c) i. Write a sketch that tells you if a static variable declared and initialized is odd or even. (6 marks)
- ii. Write a sketch in Arduino that will turn on an LED on for one second, then off for one second, repeatedly. (6 marks)

QUESTION FOUR (20 MARKS)

- a) Differentiate between stepper motor and D.C. motor drives for a robot. (4 marks)
- b) Explain the applications of robots in continuous arc welding & spray painting. (6 marks)
- c) i. Write a routine that makes the BOE Shield-Bot back up at full speed for 2.5 seconds (4 marks)
- ii. Write a for loop that starts counting at 21 and stops at 39, and counts in steps of 3. (6 marks)

QUESTION FIVE (20 MARKS)

- a) Explain THREE (3) Ethical issues of inclusion of humanoids in human society. (6 marks)
- b) Define the following commands: (6 marks)
- i. WAIT
- ii. SIGNAL
- iii. DELAY
- c) The diagram shows two simple courses. Write a sketch that will make your BOE Shield-Bot navigate along ONE (1) figure **A** or **B**. Assume straight-line distances (the triangle's sides and the diameter of the circle) are either 1 yard or 1 meter. (8 marks)

