

[This question paper contains 2 printed pages.]

Sr. No. of Question Paper : 5731

Your Roll No.....

Unique Paper Code: 2514000022

L

Name of the Course: B.Sc (Hons) Electronics(GE)

Name of the Paper: **Arduino/ RPi App Development**

Semester: IV

Duration: 02 Hours

Maximum Marks: 60

Instruction for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question 1 is compulsory.
3. There are six questions. Attempt any 4 questions including question 1.

- Q.1. (a) List the major features and functionalities of Arduino Uno/Raspberry Pi development board which makes it suitable for robot designing and automated system development.
- (b) What are the methods for flashing (loading) a program into the microcontroller board?
- (c) What is Embedded C? How is it different from standard C?
- (d) What is an Integrated Development Environment (IDE)? Give any one example of IDE used for Arduino/Rpi.
- (e) What is a seven-segment display? Differentiate between common anode and common cathode configuration.

(3x5 =15)

- Q.2. (a) What is role of analog input pins and digital input/output pins of an Arduino/Rpi board. How do we configure digital input/output pins? Explain with the help of an example.
- (b) Compare Arduino board and a Raspberry Pi board with respect to processor type, operating system, programming approach and application areas.

(8+7)

- Q.3. (a) Explain various wireless communication protocols which can be used to communicate with an automated system/ robot designed using an Arduino/RPi board.
- (b) Design a traffic light control system in which the red light remains ON for 20 seconds, the orange light remains ON for 10 seconds, and the green light remains ON for 40 seconds. Draw the logical/schematic diagram required to implement this system and explain its working.
- Further, describe how camera-based vision system can be integrated with the traffic light controller to dynamically adjust the duration of the red, orange, and green signals based on the level of vehicular congestion at the intersection.

(6+9)

- Q.4. (a) Differentiate between contact-type and non-contact type sensors? Explain the working principle of an infrared proximity sensor for obstacle detection?
- (b) With the help of a schematic diagram, explain how a PIR (Passive Infrared sensor) is interfaced with the Arduino/RPi and used for motion sensing applications. Further, discuss how the system can be programmed to calculate the distance of an obstacle or a vehicle moving towards or away from the sensor.

(7+8)

- Q.5. (a) What is the importance of sensors in a robot? Explain the working principle and use case of the following sensors in a mobile robot
- (i) Position Encoder
 - (ii) Ultrasonic sensor
 - (iii) LDR
- (b) List the various types of sensors which can be used to measure the following internal parameters of a robotic vehicle:
- (i) Angular rotation of the wheels
 - (ii) velocity
 - (iii) acceleration

(9+6)

- Q.6. (a) What is a gyro sensor (gyroscope)? Explain the working principle and applications of a gyro sensor.
- (b) Explain how LCD/LED dot matrix is interfaced with an Arduino/Rpi to display a simple text message?
- (c) A robotic arm is to be designed for picking and placing of objects. Illustrate on the various types of sensors which may be used.

(5+5+5)