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***** 헬스케어신호처리개론 2018.04.26 (목)

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1. What is the incorrect introduction to Arduino?

A. Arduino is simple and inexpensive.
B. Arduino is based on open source.
C. Arduino programming is simple and clear.
D. Arduino supports only Linux platform.

2. Which one is the correct conversion from the output (a0value) of potentiometer at A0 to the integer unit of percent (%)?

A. int pct = map(a0value, 0, 256, 0,100); // %
B. int pct = map(a0value, 0, 256, 0,256); // %
C. int pct = map(a0value, 0, 1023, 0,100); // %
D. int pct = map(a0value, 0, 1023, 0,256); // %

3. PWM (Pulse Width Modulation) ia a technique for getting analog results with digital means. By changing pwm_value in analogWrite(pin, pwm_value) function, we can control the voltage of an LED connected to PWM pin-9. Which one is the correct usage of analogWrite() to keep an LED 50 % bright by supplying 50 % duty cycle?

A. analogWrite(9, 0.5)
B. analogWrite(9, 127)
C. analogWrite(9, 50)
D. analogWrite(9, 255)

4. What is the incorrect introduction to Node.js?

A. Node.js is a a JavaScript runtime built on Chrome's V8 JavaScript engine.
B. Node.js uses an action-driven architeture.
C. Node.js uses a non-blocking I/O model across distributed devices.
D. Npm is Node.js' package ecosystem with open source libraries.

5. What is the command to complete a node project by installing node modules defined in package.json?

A. npm init
B. npm setup
C. npm start
D. npm install

6. How can you install a node module socket.io of the specific version 1.7.3? The version of installed module will be definitely written in package.json.

A. npm init —save socket.io@1.7.3
B. npm init —save socket.io#1.7.3
C. npm install —save socket.io@1.7.3
D. npm install —save socket.io#1.7.3

7. Where is the suitable keyword to make a local module that user defines in the below code? The name of local module is "hsnninfo.js".

```
// hsnninfo.js
module.___[7]____ = function (id, name, phone) {
        console.log('My Info');
        console.log('ID : ' + id);
        console.log('Name : ' + name);
        console.log('Phone : ' + phone);
}
```

A. export
B. exports
C. package
D. packages

8. What function do you use to connect with a local module "hsnninfo.js"?

```
// myinfo.js
var myinfo = ____[8]____('./hsnninfo');
myinfo('hs77', 'HCit', '010-1234-5678');
```

A. import B. callback C. request D. require

9. The below code snippets simply runs HTTP server in node.js.

```
// http server (web server)
var http = require('http');
var port = 3000;

var server = http.createServer(function(request, response) {
   response.writeHeader(200, {
      "Content-Type": "text/plain"
   });
   response.write("Hello HTTP server from node.js!");
   response.end();
});

server.____[9]____(port);
console.log("Server Running on " + port +
            ".₩nLaunch http://localhost:" + port);
```

What function is used to set up a server to a given port?

A. send B. require C. listen D. connect

10. The below code snippets runs TCP client in node.js.

```
// tcp client
var net = require('net');
var port = 3000;
var client = new net.Socket();

client.connect(port, "127.0.0.1");
client.____[10]____ ('data', function (data) {
    console.log('Data: ' + data);
    client.destroy();
});
```

What event can you set for a network client to check data incoming from TCP server?

A. on B. get C. off D. use

11. Now, you make an express application "hsnnApp" using express-generator. Select a command that can not launch hsnnApp.

A. ^B on a file ./bin/www
B. npm start
C. node ./bin/www
D. node ./app.js

12. The below code snippets is ./routes/index.js with two routes in an express application, hsnnApp.

```
var express = require('express');
var router = express.Router();

/* GET home page by /. */
router.get('/', function(req, res, next) {
  res.____[12]____('index', { title: 'Express by HS77' });  // views/index.jade
});

/* GET my info page by "???". -> multi-routing */
router.get('/hs77', function(req, res, next) {
  res.____[12]____('hsnninfo', { title: 'Express App',
                                 id: 'HS77',
                                 name: 'HealthCare, HCit' });  // views/hsnninfo.jade
});

module.exports = router;
```

When you connect to express host using a route, the express host will show a html page that was converted from a jade file for a given route?

What is the correct function to return a jade file matching with the route?

A. write B. send C. render D. show

13-15. 다음은 TMP36 온도센서를 A0, CdS 센서를 A1에 연결한 후, 각각의 아날로그 측정값을 이용하여 섭씨온도와 조도(lux)로 구하여 LCD에 표시하는 아두이노 코드이다. 밑줄 친 곳에 알맞은 코드는?

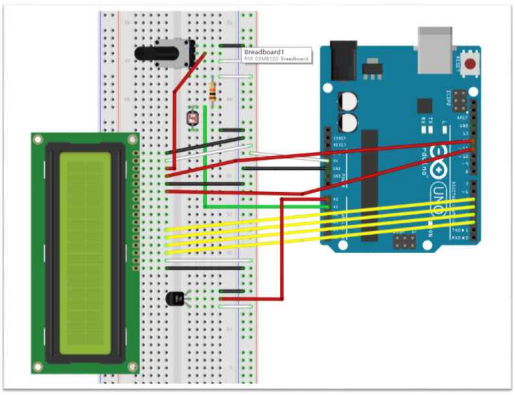
```
/*
 온도, 빛 입력 및 LCD 모니터링
*/

// LCD 라리브러리 설정
#include <LiquidCrystal.h>

// LCD 설정
LiquidCrystal lcd(12, 11, 5, 4, 3, 2); // rs,en,d4,d5,d6,d7

// 0번 아날로그핀을 TMP36 온도 입력으로 설정한다.
// 1번 아날로그핀을 CdS 조도 입력으로 설정한다.
#define TMP36_INPUT 0
#define CDS_INPUT 1

void setup() {
  Serial.begin(9600);
// 16X2 LCD 모듈 설정하고 백라이트를 켠다.
  ____[13]____  // Prob.13
// 모든 메세지를 삭제한 뒤
// 숫자를 제외한 부분들을 미리 출력시킨다.
  lcd.____[14]____);
  lcd.setCursor(0,0);
  lcd.print("HS00,Temp: ");
  lcd.____[15]____;
  lcd.print("Light:  ");
  lcd.setCursor(13,1);
  lcd.print("lux");  //
}
```



```
void loop(){
  // Temperature from TMP36
  int temp_value = analogRead(TMP36_INPUT);
  // converting that reading to voltage
  float voltage = temp_value * 5.0 * 1000;
  // in mV
  voltage /= 1023.0;
  float tempC = (voltage - 500) / 10 ;

  // Lux from CdS (LDR)
  int cds_value = analogRead(CDS_INPUT);
  int lux = int(luminosity(cds_value));
  // 전에 표시했던 내용을 지운다.
  lcd.setCursor(12,0);
  lcd.print("    ");
  // 온도를 표시한다
  lcd.setCursor(12,0);
  lcd.print(tempC);
  // 전에 표시했던 내용을 지운다.
  lcd.setCursor(9,1);
  lcd.print("   ");
  // 조도를 표시한다
  lcd.setCursor(9,1);
  lcd.print(lux);
  // Serial output --> 온도,조도
  Serial.print("HSnn");
  Serial.print(",");
  Serial.print(tempC);
  Serial.print(",");
  Serial.println(lux);
  delay(1000);
}

//Voltage to Lux
double luminosity (int RawADC0){
  double Vout=RawADC0*5.0/1023.0;
  // 5/1023 (Vin = 5 V)
  double lux=(2500/Vout-500)/10.0;
  // lux = 500 / Rldr,
  // Vout = Ildr*Rldr = (5/(10 + Rldr))*Rldr
  return lux;
}
```

13. 16X2 LCD 모듈 설정하고 백라이트를 켜는 함수는?

A. start(16,2)
B. light(16,2)
C. begin(16,2)
D. init(16,2)

14. LCD 화면 전체를 지우는 함수는?

A. clear()
B. clean()
C. wipe()
D. delete()

15. LCD의 아래 칸으로 커서를 이동하는 함수는?

A. setCursor(1,0)
B. setCursor(0,1)
C. setCursor(1,1)
D. setCursor(0,0)

16-19. 아두이노에서 무작위수 세 개가 만들어져 '조도,습도,온도'의 자료구조로 매초 직렬통신으로 PC에 전송되고 있다. node.js에서 'serialport' module을 이용해서 세 개의 신호를 분리(parsing)해서 '시간,조도,습도,온도'의 구조로 배열 mdata에 넣는다. 'socket.io' module로 mdata 배열에 담긴 IOT 데이터를 네트워크에 전송한다.
빈 곳에 적합한 코드를 찾으시오.

```
// multi_signals_node.js
var serialport = require('serialport');
var portName = 'COM10';  // check your COM port!!
var port     =    process.env.PORT ___[16]___|| 3000;
var io = require('socket.io').listen(port);
// serial port object
var sp = new serialport(portName,{
    baudRate: 9600,    // 9600  38400
    dataBits: 8,
    parity: 'none',
    stopBits: 1,
    flowControl: false,
    parser: serialport.parsers.readline('₩r₩n')
});
// Parsing data from serial port
var dStr = '';
var readData = '';  // this stores the buffer
var lux ='';
var humi ='';
var temp ='';
var mdata =[];
// this array stores date and data from multiple sensors
var firstcommaidx = 0;
var secondcommaidx = 0;

sp.on('data', function (data) {
// call back when data is received
    readData = data.toString(); // append data to buffer
    firstcommaidx = readData.indexOf(',');
    secondcommaidx = readData.___[17]___indexOf(',', firstcommaidx+ 1);
// parsing data into signals
    if (firstcommaidx > 0 && secondcommaidx > firstcommaidx) {
        lux = readData.substring(0, firstcommaidx);
        humi = readData.___[18]___substring(firstcommaidx + 1,
                                            secondcommaidx);
        temp = readData.substring(secondcommaidx + 1);
        readData = '';
        dStr = getDateString();
        mdata[0]=dStr;  // Date
```

전송데이터
조도,습도,온도

```
7.67,145
7.18,66
8.16,40
8.16,54
```

```
        mdata[1]=lux;    // luminosity data
        mdata[2]=humi;   // humidity data
        mdata[3]=temp;   // temperature data
        console.log("HSnn," +  mdata);
        io.sockets.___[19]___emit('message', mdata);
        // send data to all clients
    } else {   // error
        console.log(readData);
    }
});
io.sockets.on('connection', function (socket) {
    // If socket.io receives message from the client browser then
    // this call back will be executed.
    socket.on('message', function (msg) {
        console.log(msg);
    });
    socket.on('disconnect', function () {
        console.log('disconnected');
    });
});
// helper function to get a nicely formatted date string
function getDateString() {
    var time = new Date().getTime();
    // 32400000 is (GMT+9 Korea, GimHae)
    // for your timezone just multiply +/-GMT by 3600000
    var datestr = new Date(time +32400000).
    toISOString().replace(/T/, ' ').replace(/Z/, '');

    return datestr;
}
```

16. 소켓 네트워크 포트를 지정하는 올바른 코드는?

A. ||  B. |  C. &&  D. &

17. 직령통신 전송 데이터에서 두 번째 comma(,)의 인덱스를 구하는 코드는?

A. indexOf(',', firstcommaidx)  B. indexOf(',', firstcommaidx+1)

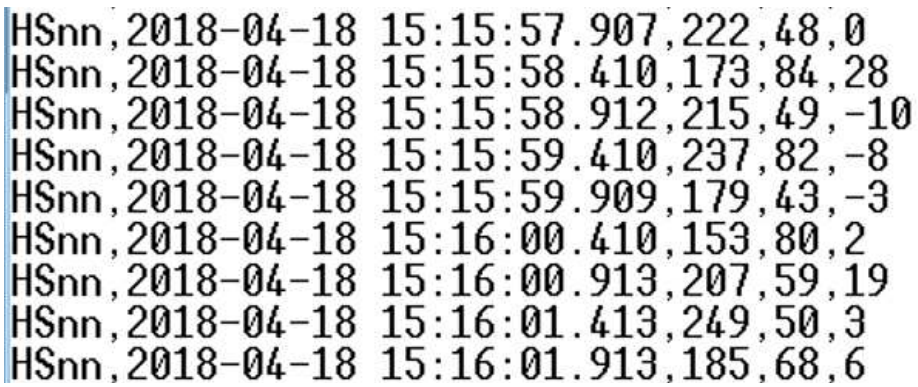
C. indexOf(',', firstcommaidx+2)  D. indexOf(',', firstcommaidx+3)

18. 습도(humi) 값을 문자열로 구하는 방법은?

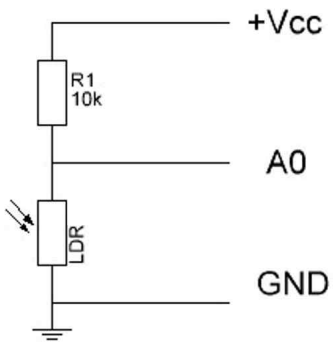
A. substring(firstcommaidx, secondcommaidx)
B. substring(firstcommaidx, secondcommaidx + 1)
C. substring(firstcommaidx + 1, secondcommaidx)
D. substring(firstcommaidx + 1, secondcommaidx + 1)

19. mdata 배열에 저장된 (시간,조도,습도,온도)를 소켓을 통해 모든 클라이언트에게 전파할 때 사용되는 코드는?

A. send('message', mdata)
B. send('data', mdata)
C. emit('message', mdata)
D. emit('data', mdata);



[20] 다음은 CdS 회로에서 A0 아날로그 출력값을 전압으로 일차 환산하고,
다시 조도(lux)로 환산하는 과정이다. (총 2점, 1점은 bonus)




$$
\begin{aligned}
&(a)\ V_{out} = \frac{R_{ldr}}{(R_1 + R_{ldr})} * V_{CC}\ ,\\
&(b)\ R_{ldr} = \frac{10 * V_{out}}{(5 - V_{out})}\ (k\Omega)\ ,\\
&(c)\ V_{out} = value * V_{CC}/1023\ ,\\
&(d)\ Lux = \frac{500}{R_{ldr}}\ ,\\
&(e)\ Lux = (\frac{2500}{V_{out}} - 500)/10\ (lux).
\end{aligned}
$$

A. R1=10kΩ, Vcc = 5 V 일 때 식(a)로부터 식 (b)를 유도하시오.

$$
\begin{aligned}
V_{out} &= \frac{5 * R_{ldr}}{(10 + R_{ldr})}\ ,\\
(10 + R_{ldr}) * V_{out} &= 5 * R_{ldr}\ ,\\
5 * R_{ldr} &= (10 + R_{ldr}) * V_{out}\ ,\\
(5 - V_{out}) * R_{ldr} &= 10 * V_{out}\ ,\\
R_{ldr} &= \frac{10 * V_{out}}{(5 - V_{out})}\ (k\Omega)\ .
\end{aligned}
$$

B. 식 (b)를 식 (d)에 넣어서 식 (e)를 유도하시오.

$$
\begin{aligned}
Lux &= \frac{500}{R_{ldr}}\ ,\\
&= \frac{500 * (5 - V_{out})}{10 * V_{out}}\ ,\\
&= \frac{(\frac{2500}{V_{out}} - 500)}{10}\ ,\\
&= (\frac{500}{V_{out}} - 50)\ (lux)\ .
\end{aligned}
$$