Quiz 5

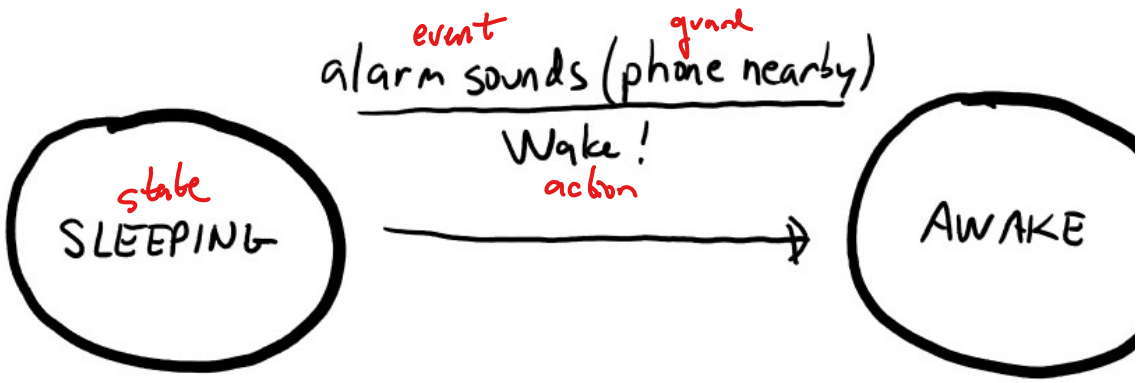
This is a preview of the published version of the quiz

Started: Feb 23 at 5:02pm

Quiz Instructions

Question 1 — 1 pts

In the diagram shown, what is represented by "phone nearby"?



- a state
- an event
- a guard condition
- an action
- a switch statement

Question 2 — 1 pts

Convert the following if...else block, which represents the response of a bug robot to a light coming on, to a switch statement.

```
if(state == FORAGING) {Evade(); state = EVADING;}
else if(state == SLEEPING) {Wake(); Evade(); state = EVADING;}
else if(state == EATING) {Freeze();}
else if(state == HIDING) {} //do nothing
```

HTML Editor

```
switch (state)
{
  case SLEEPING:
     Wake();
  case FORAGING:
     Evade();
     state = EVADING;
     break;
  case EATING:
     Freeze();
     break;
}
```

0 words

Question 3 1 pts

The wind resistance on a cyclist (in still air) can be calculated by the formula

$F_{wind} = \alpha \cdot V^2$

where α is some constant with units of $N/(m/s)^2$ and V is the forward velocity.

A cyclist has put a motor on her bicycle and implemented a proportional controller. With this controller, the *power* put into the motor is calculated as,

$P = K_p(V_{target} - V) = F_m \cdot V \Rightarrow F_m = K_p \frac{V_t - V}{V}$. At eq., $F_n = F_w$, so

with P in Watts and V in m/s.

$K_p \frac{V_t - V}{V} = \alpha V^2 \Rightarrow \alpha = K_p \frac{V_t - V}{V^3}$

She sets $K_p = 32$ and sets out on her bike. If the target speed is 10 m/s, but the actual speed, 8 m/s, what is α? Write your answer to three significant digits. You do not need to write units (which are given above).

$\alpha = 32 \cdot \frac{10\frac{m}{s} - 8\frac{m}{s}}{(8\frac{m}{s})^3} = \frac{2 \cdot 32}{8^3} = \frac{1}{8} = 0.125$

Question 4 1 pts

What can the cyclist do to remove the steady-state error (also called the offset error)?

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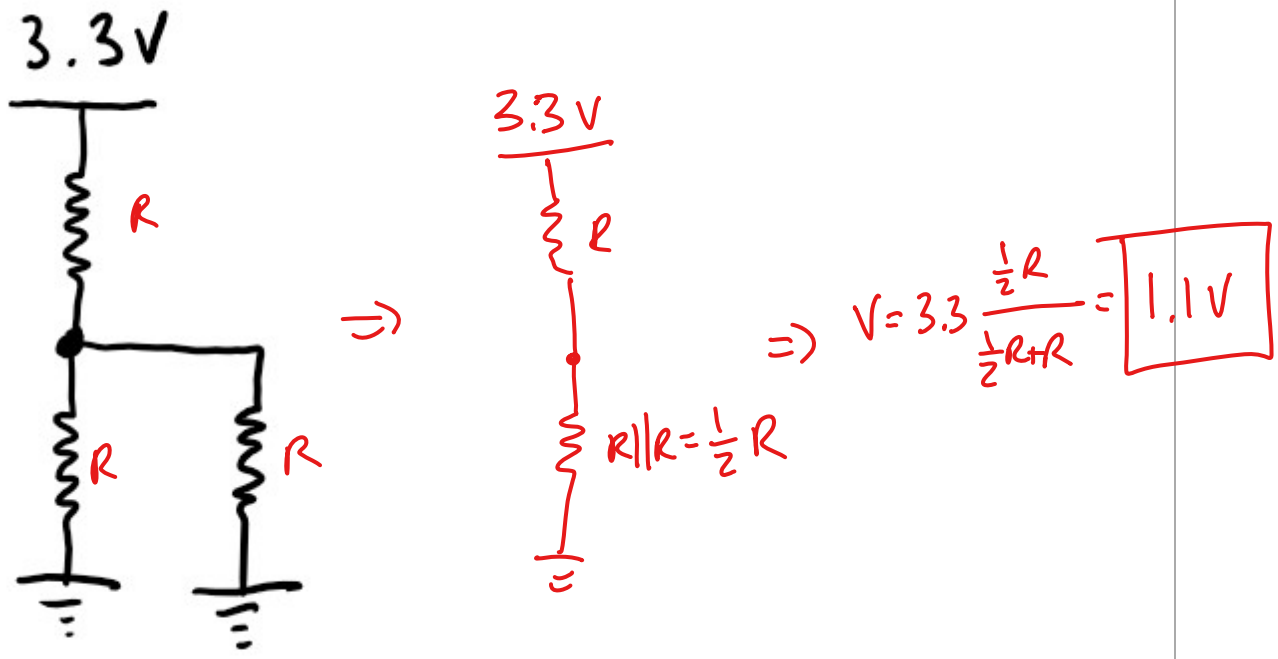
INTEGRAL CONTROL!

0 words

Question 5 — 1 pts

In the following figure, what is the voltage at the junction of the resistors? All three resistors have the same resistance. Don't forget units!



Question 6 — 1 pts

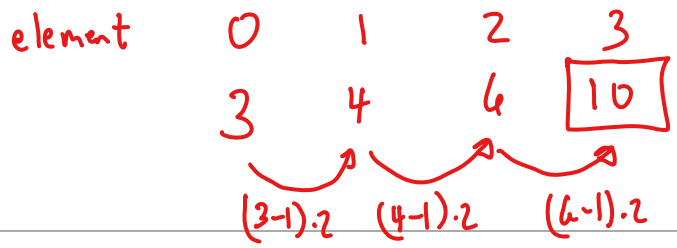
You build an array as follows:

```
int myArray[5];

myArray[0] = 3;

for(int i = 1; i<5; i++) {myArray[i] = (myArray[i-1] -1) * 2;}
```

What is the index of the *last* element in the array? 4 (zero-based)

Question 7 1 pts

With respect to the array in the previous question, what is the value of the element held in myArray[3]?



Question 8 1 pts

You are writing a checker function to detect the *change* in a sensor output (any change). Fill in the line of code represented in the blank. Assume GetSensorReading() returns a value between 0 and 10;

```
bool SensorChecker(void)
{
  static int prevSensorReading = 0;
  bool returnValue = false;
  int sensorReading = GetSensorReading();
  if(prevSensorReading != sensorReading) returnValue = true;  // <-- your code here

  prevSensorReading = sensorReading;
  return returnValue;
}
```

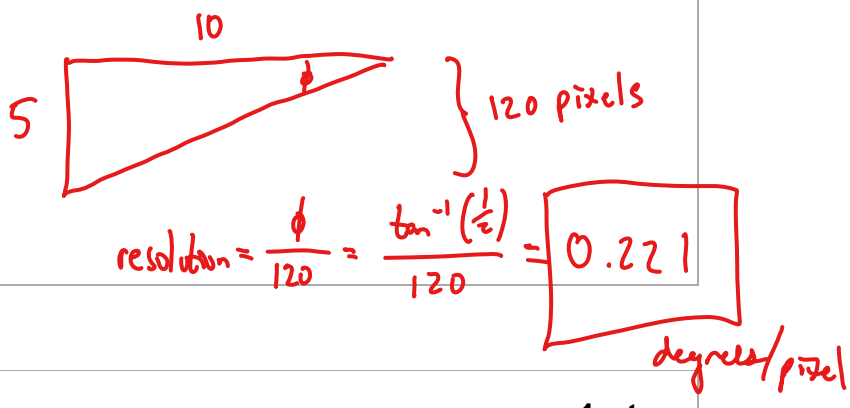
HTML Editor

0 words

Question 9 1 pts

You have a digital camera with 240 pixels in the *vertical* direction, and you want to calculate the angular resolution, in degrees per pixel. You and a friend realize that your eyes are both exactly 5 feet above the ground, so you walk backwards and look through the camera until you can *just* see where her shoes touch the floor when the camera is centered on her eyes, and then you measure the distance from the camera to your friend to be 10 feet.

What is the angular resolution of the camera in degrees per pixel? Write your answer to three significant digits, but don't write the units (which are degrees per pixel).



Question 10 1 pts

How many points do you get for scoring a Golden Pizza in the OED if Gompei is *not* moved to your side?

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