# Question 1

A good problem statement for your automated turret system would accomplish the following (circle **all** that apply):

(a) Allow for design trade space and open-ended solutions

(b) Ensure the design looks exactly like the ones from the previous year

(c) Include any constraints or clarifying data that scope the problem

(d) Dictate the type of control algorithm required at the start of the project

(e) Clarify both what the design will and won't do

(f) Consider any external interactions and influences that could affect the design

(g) Be very generic such that the objectives and design goals could be anything!

# Question 2

The purpose of presenting thorough background research in an engineering report or publication is to (circle **all** that apply):

(a) Justify the contribution by comparing it to existing projects

(b) Increase the length of the document

(c) Convince the reader that you are not "reinventing the wheel" (i.e. repeating an existing and fully documented project)

(d) Demonstrate a understanding of the field

(e) Background research serves no real purpose

## Question 3

What is the purpose of the component shown in Fig. 1 (circle **one**)?



Figure 1: 50N06 MOSFET

(a) Allow bidirectional control of a motor using logic level PWM and a direction pin

(b) Acts as a switch and provides the required current to power to our motors

(c) Look nice in your firing circuit

(d) Prevent current from flowing back into an mBed

## Question 4

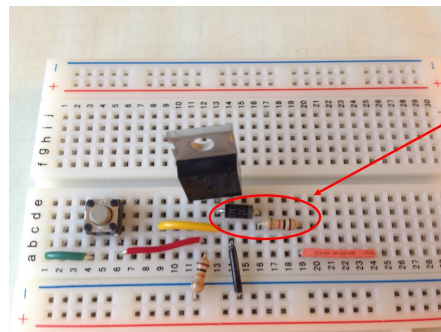What is the purpose of the components shown in Fig. 2 (circle **one**)?



Figure 2: Manual Firing Circuit with important components highlighted and circled in red.

(a) Ensures the voltage at the gate is set to 0V when the circuit is closed

(b) Provide an adjustable, regulated voltage output

(c) Look nice in your firing circuit

(d) Allow a path for the inductive motor current to flow when the circuit is opened

## Question 5

Why did we implement switches into the firing circuit prior to implementing the mbed (circle **all** that apply)?

(a) To test a simplified version of the circuit prior to implementing a microcontroller

(b) To inject a gratuitous discussion of switches into the course

(c) To confirm proper circuit wiring prior to implementing a microcontroller

(d) To avoid burning out Mbed I/O pins with improper circuit implementations
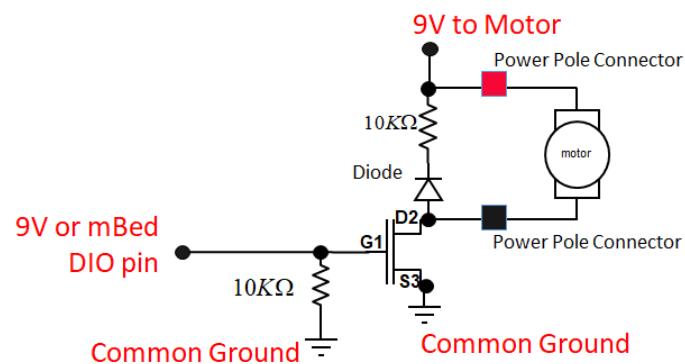
## Question 6

Circle the pulldown resistor in Fig. 3.



Figure 3: Single MOSFET-based firing circuit.

## Question 7
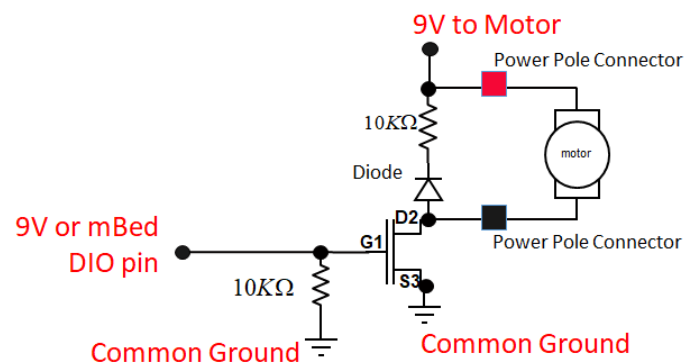
Circle the snubber circuit in Fig. 4



Figure 4: Single MOSFET-based firing circuit.

## Question 8

What type of camera are we using for the computer vision subsystem of our project?

(a) HD 720P 1.0MP Wide Angle Mini USB CCTV Camera

(b) iCubie USB wecam

(c) OV2710 high resolution micro USB camera

(d) There is a camera in this project?

## Question 9

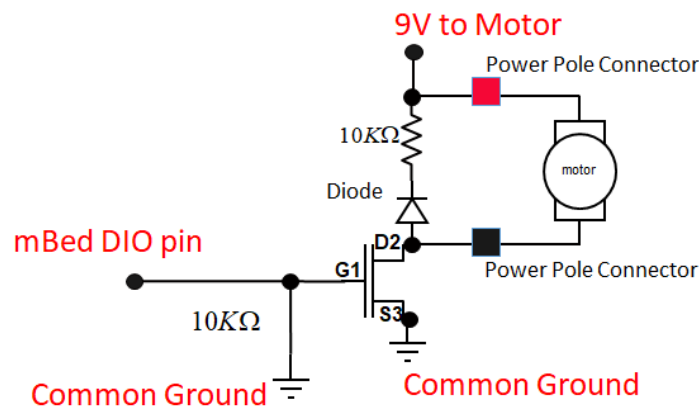What will happen when you set the mBed DIO pin to high in Fig. 5 (circle all that apply)?



Figure 5: Single MOSFET-based firing circuit with a shorted-pulldown.

(a) The motor will spin faster than normal

(b) The motor will not spin at all

(c) The switch and connected wires may get warm or even hot

(d) The motor will spin slower than normal

## Question 10

What is the purpose of computer vision in our EW309 project (circle all that apply)?

(a) To process images using color thresholding

(b) To find the centroid (center) of our desired target to eventually aim the turret

(c) To process images using object properties

(d) To estimate the conversion from linear units to pixels and vice versa