6.163 Strobe Project Laboratory

Sample quiz

1

The Marine Hydrodynamics Laboratory at MIT has a water tunnel in which researchers test propellers, hydrofoils and other sorts of submerged objects. For propeller experiments there is a strobe light that permits the motion of the blades to be 'stopped'. The strobe can be triggered by a magnetic pickup on the propeller shaft so that it fires once per revolution, and delay can be added so that the propeller can be viewed at any desired point in its rotation. There is a need to have photographs of the propeller blade for presentation at conferences. Someone else ran exposure tests a while back, so you know what f-stop to use for a single flash. You would like your photographs to be exposed by a single flash to get the clearest image. The camera has no control over the strobe firing rate or when the strobe fires. The 12Ó diameter propeller is rotating at 2400 rpm.

A - What shutter speed should you set on your camera? [Be sure to explain your reasoning.] The camera has a focal plane shutter that is completely open for the following times:

camera setting	full open time, ms
1/90	2
1/60	6
1/30	22
1/15	54
1/8	118
1/4	246
B	as long as you hold it

B- Even with the best choice of shutter speed something can go wrong. What is it, and what would you do to ensure that you get good pictures?

In order to have good picture quality you want to minimize blurring. You decide that it is permissible for the propeller to rotate no more than 1 degree during the exposure.

C- What is the maximum permissible flash duration?

2

A lab has a small centrifuge that is making a banging noise. They want you to image the problem so that it can be fixed. One of your first questions is "Does this just happen once in a while or does it seem to be regular (once per revolution)?" Why would you ask this, and how would it influence what equipment you might take to tackle the job in either case? Which techniques that you learned in lab would be applicable (or not), and how?

Happens once in a while

stroboscope -

microflash -

synch/delay -

multiflash -

high speed video -

Regularly periodic

stroboscope -

microflash -

synch/delay -

multiflash -

high speed video -

3

You are commissioned to take detailed photographs of a cobra's head in the process of striking, from a side-on view. Unless you actually want to be in the pit with the reptile you will have to stay behing a railing 10 feet away. The position at which the cobra will strike can be well controlled, so where to aim the camera is not an issue. The event is mostly horizontal, and you want to image an area 12" - 13" wide onto 35 mm film (24x36 mm).

A- What is the right focal length lens to use?

B- You would like the blur from movement during the strike to occupy no more than 0.2 mm on the film. What is the maximum flash duration that will allow you to achieve this? [If you do not know the value of any needed quantities, use variables and express the answer as an equation.]