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17/ENG06/012

MECHANICAL ENGINEERING

                                                                 QUESTION ONE

                                                                     Dry Friction

**Dry friction** is the force that opposes one solid surface sliding across another solid surface. Dry friction always opposes the surfaces sliding relative to one another and can have the effect of either opposing motion or causing motion in bodies.

The most commonly used model for dry friction is **coulomb friction**. This type of friction can further be broken down into static friction and kinetic friction

A perfect practical example would be the friction between the wheels of an automobile and the road

                                              Fluid Friction

**Fluid friction** is the force that resists motion either within the fluid itself or of another medium moving through the fluid. There is **internal friction**, which is a result of the interactions between molecules of the fluid, and there is **external friction**, which refers to how a fluid interacts with other matter.

A practical examples is the wind resistance felt by human hand when it is stretched out the window of a moving car.

                                                                QUESTION TWO

                                                                     WEDGES  
  
A wedge is simply a triangular tool, often made of metal, wood, stone or plastic. It is thick on one end and tapers to a thin or sharp edge on the other end. Technically it is an inclined plane (or two inclined planes put together to form a triangle) that moves. A wedge may be attached to a handle to make it easier to use. Good examples of wedges are nails, knives, axes and your teeth!

A wedge can be used in many ways:  
Description: uses of a wedge simple machineTo cut (knife)  
Description: uses of a wedge simple machineTo split (axe)  
Description: uses of a wedge simple machineTo tighten and to hold back (doorstopper)  
Description: uses of a wedge simple machineTo hold together (nail)  
Description: uses of a wedge simple machineTo scrape (blades on the snowplough or farm grader)

                                           SQUARE THREAD SCREW

The **square thread form** is a common [screw thread](https://en.wikipedia.org/wiki/Screw_thread) form, used in high load applications such as [lead screws](https://en.wikipedia.org/wiki/Leadscrew) and [jackscrews](https://en.wikipedia.org/wiki/Jackscrew). It gets its name from the square cross-section of the thread. It is the lowest friction and most efficient thread form, but it is difficult to fabricate.

Advantages & disadvantages

The greatest advantage of square threads is that they have a much higher intrinsic efficiency than [trapezoidal threads](https://en.wikipedia.org/wiki/Trapezoidal_threads) ([Acme](https://en.wikipedia.org/wiki/Acme_thread_form) or metric trapezoidal). Due to the lack of a [thread angle](https://en.wikipedia.org/wiki/Thread_angle) there is no radial pressure, or [bursting pressure](https://en.wikipedia.org/wiki/Bursting_pressure), on the nut. This also increases the nut life.

The greatest disadvantage is the difficulty in machining such a thread. The [single-point cutting tools](https://en.wikipedia.org/wiki/Tool_bit) or [taps and dies](https://en.wikipedia.org/wiki/Tap_and_die) used to cut the thread cannot have efficient rake and relief angles (because of the square form), which makes the cutting slow and difficult. Square threads also cannot carry as much load as a trapezoidal thread, because the root of the square thread is smaller. Also, there is no way to compensate for wear on the nut, so it must be replaced when worn out.

Classification

Square threads are defined as follows by [ISO](https://en.wikipedia.org/wiki/International_Organization_for_Standardization) standards:

{\displaystyle Sq\,60\times 9}

where Sq designates a square thread, 60 is the nominal diameter in millimeters, and 9 is the pitch in millimeters. When there is no suffix it is a single start thread. If there is a suffix then the value after the multiplication sign is the [lead](https://en.wikipedia.org/wiki/Lead_(engineering)) and the value in the parentheses is the pitch. For example:

{\displaystyle Sq\,60\times 18(P9)LH}

would denoted two starts, as the lead divided by the pitch is two. The "LH" denotes a left hand thread.

                                                        JOURNAL BEARINGS

A journal bearing is essentially a cylindrical shaft in a cylindrical cavity of larger diameter and the space between them contains a liquid lubricant.

The purpose of a bearing is to support a load, typically applied to a shaft, whilst allowing relative motion between two elements of a machine. The two general classes of bearings are journal bearings, also known as sliding or plain [surface bearings](https://www.sciencedirect.com/topics/engineering/bearing-surface), and rolling element bearings, sometimes also called [ball bearings](https://www.sciencedirect.com/topics/engineering/ball-bearings). The aims of this chapter are to describe the range of bearing technology, to outline the identification of which type of bearing to use for a given application, and to introduce journal [bearing design](https://www.sciencedirect.com/topics/engineering/bearing-design) with specific attention to boundary lubricated bearings and full film hydrodynamic bearings.