

FACTFILE: GCE TECHNOLOGY & DESIGN

1.47 MECHANICAL COMPONENTS AND SYSTEMS



Brakes

Learning outcomes

Students should be able to:

- demonstrate knowledge and understanding of:
 - brakes to include cantilever, band, disc and drum

Course content

Students should have a knowledge and understanding of the types of brakes that could be used in a number of applications, including bicycles, cars and in industrial machinery. A brake is a device that, by using friction, is able to slow down or stop a vehicle or machine. There are a number of various types of brake that, although they all do the same job, work in slightly different ways. They are usually activated using either hydraulics or cables.

Cantilever brakes

Cantilever brakes are commonly found on bicycles. This is a brake where each arm of the brake is attached to a separate pivot point which are on either side of the forks. They can be used on either front or rear wheels, of the bicycle.

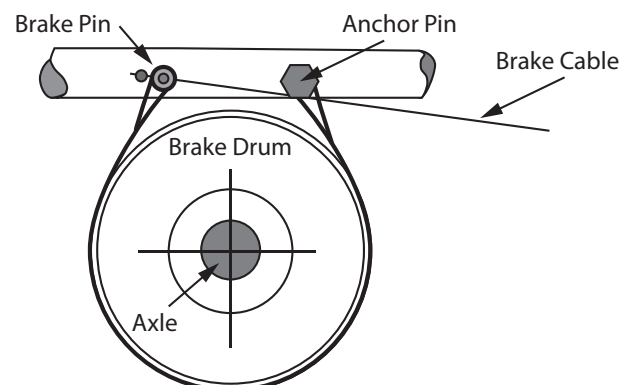
Cantilever brakes are based on the principle of the second class lever. The arm pivots below the rim of the wheel with the brake block being positioned above the pivot. As the brake cable is pulled the



lever is pivoted upwards thus moving the brake blocks towards the rim of the wheel.

Band brakes

Band brakes are brakes that are made up of a friction material that tightens around a cylinder in order to stop it rotating. This type of brake is usually found in industrial situations and are used on machines such as winches, band saws and chain saws.

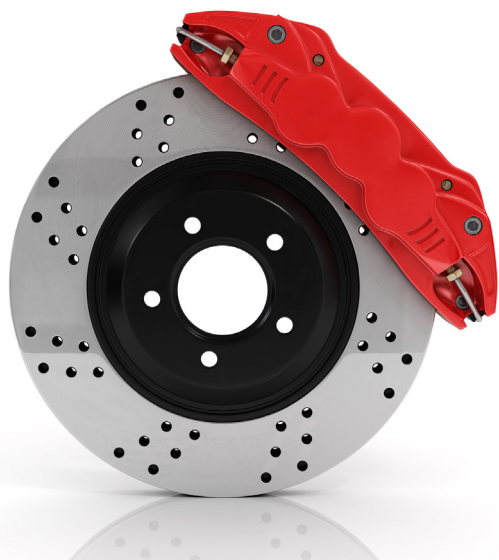


In a band brake, tension is applied to the band by a lever. As the tension is applied, the band applies friction on the drum and slows the drum down. When the tension is released, the friction is removed and the drum is allowed to rotate freely.

Disc Brakes

A disc brake is a braking system that uses callipers, usually activated by hydraulics, to squeeze pads of friction material against a rotating disc positioned on a shaft in order to slow the shaft down. They are commonly found in motor vehicles. The discs themselves are usually manufactured from grey iron. Some discs are solid, whereas other are hollow or have fins or holes drilled in them. Discs that have fins or holes drilled in them are referred to as “ventilated discs” and are designed in this way so as to dissipate the heat generated during the braking process.

In some instances, more modern materials have been used for the discs in brakes. For example, ceramic composites have been developed for braking systems. These materials have a very high tolerance to heat, thus making them ideal in situations where high temperatures are produced through friction and have a good mechanical strength, which again makes them ideal for brakes. However, the disadvantage of modern materials for mass produced cars is its high cost.



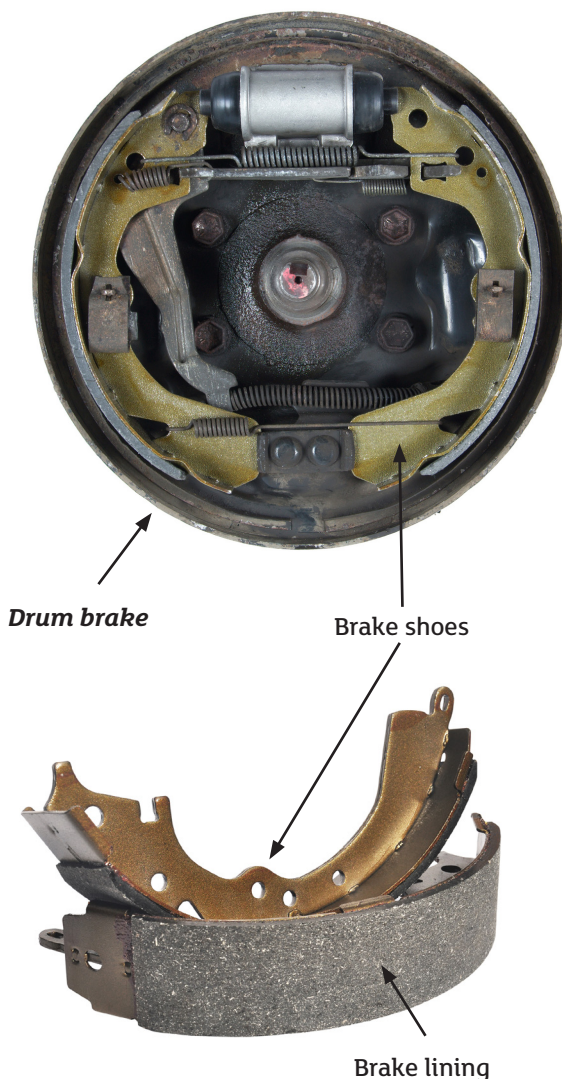
Disk Brake

Drum brakes

A drum brake is a braking system that again uses friction. In this instance, brake shoes with friction material brake pads are pressed outwards on a rotating drum which is fixed to a shaft, usually an axle on a car, that causes the drum and therefore the shaft to slow down.

The brake drum is manufactured from cast iron. The most important features of the drum are that it is wear resistant and will conduct heat. It rotates with the wheel and the axle. As with all braking systems when the brake is applied, considerable heat through friction is generated.

In cars the drum brake is activated by hydraulics. A piston on each shoe is activated and pushes against the drum by hydraulic fluid as the driver pushes the brake pedal. When the pedal is released a spring returns the shoe to its original position.



? Revision Questions

1 With reference to types of lever describe the actions of a cantilever brake on a bicycle when the brake is activated and released.

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2 Explain how disc brakes use hydraulics to slow down a vehicle

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3 Explain the advantages and disadvantages of disc brakes as opposed to drum brakes.

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