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## Welding Class Note

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### Introduction

The welding is a process of joining two similar or dissimilar metals by fusion, with or without the application of pressure and with or without the use of filler metal. The fusion of metal takes place by means of heat. The heat may be obtained from blacksmith's fire, electric arc, electrical resistance or by chemical reaction.

The process of joining similar metals by melting the edges together, without the addition of filler metal, is called *autogenous welding*.

The process of joining similar metals with the help of filler rod of the same metal is called *homogeneous welding*.

The process of joining dissimilar metals using filler rod is called *heterogenous welding*. The filler rod material is such that its melting point is less than the parent metals.

The welding is extensively used in fabrication as an alternative method for casting or forging and as a replacement for bolted and riveted joints. It is also used as a repair medium *e.g.*, to reunite metal at a crack to build up a small part that has broken off such as gear tooth or to repair a worn surface such as bearing surface.

### 15.3 Advantages and Disadvantages of Welded Joints

Following are the advantages and disadvantages of welded joints over other joints such as riveted or bolted joints.

#### Advantages

1. The welding structures are normally lighter than riveted or bolted structures. This is due to the reason, that in welding, gussets or other connecting components are not used.
2. The welded joint provides maximum efficiency (may be 100%) which is not possible in other type of joints.
3. The alterations and additions can be easily made in the existing structures.
4. As the welding structure is smooth in appearance, therefore it looks pleasing.
5. In welded connections, the tension members are not weakened as in the case of riveted joints.
6. A welded joint has a great strength. Often a welded joint has the strength of the parent metal itself.
7. Sometimes, the members are of such a shape (*i.e.*, circular steel pipes) that they afford difficulty in riveting. But they can be easily welded.
8. The welding provides very rigid joints. This is in line with the modern trend of providing rigid frames.
9. It is possible to any part of a structure at any point.
10. The process of welding takes less time than other type of joints



#### Disadvantages

1. Since there is an uneven heating and cooling during fabrication, therefore, the members may get distorted or additional stresses may develop.
2. It requires a highly skilled labour and supervision.
3. The edge preparation is generally required before welding.
4. Since no provision is left for expansion and contraction in frame, therefore there is a possibility of cracks developing in it.
5. The jigs and fixtures are required to hold the parts in position.
6. The inspection of welding work is more difficult than riveting or bolted work.

## **Types of Welding**

The welding is broadly divided into the following two groups :

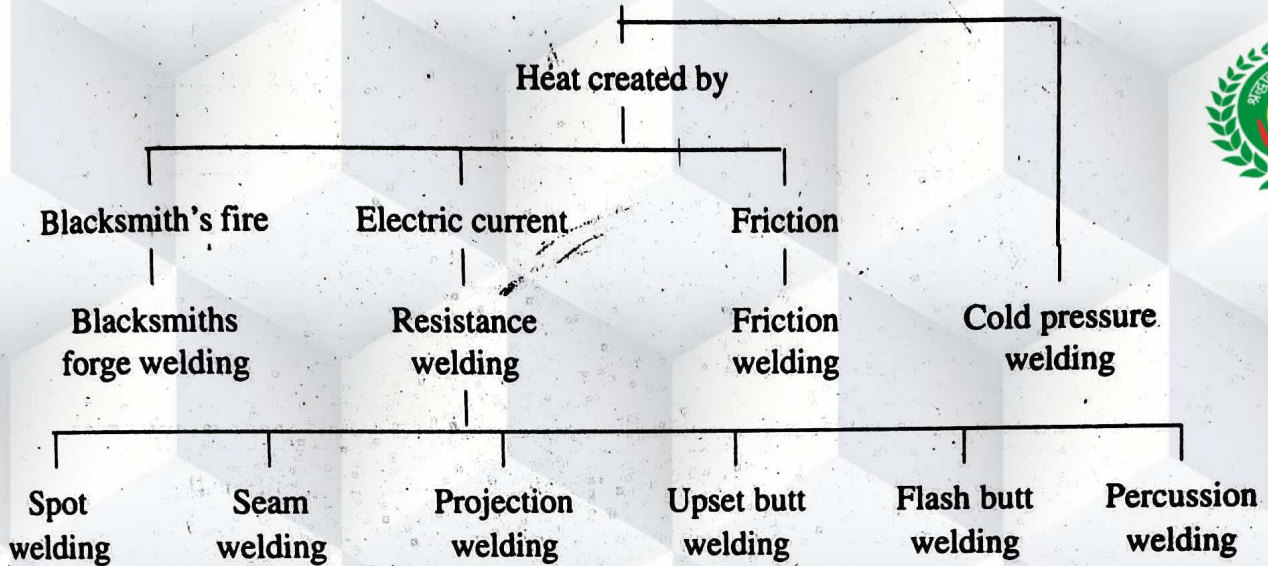
1. *Forge or pressure welding.* In forge or pressure welding (also known as plastic welding), the workpieces are heated to plastic state (except for cold pressure welding) and then the workpieces are joined together by applying pressure on them. In this case no filler material is used. The forge or pressure welding is further classified as follows :







**Forge or pressure welding**  
(under pressure without additional filler metal)



2. **Fusion or non-pressure welding.** In fusion or non-pressure welding, the edge of workpieces to be joined and the filler material are heated to a temperature above the melting point of the metal and then allowed to solidify. The fusion or non pressure welding is further classified as follows :

**Fusion or non-pressure welding**  
(With additional filler metal)

