

Question 1

- List the four classifications of steels. For each, briefly describe the properties and typical applications.
- Cite three reasons why ferrous alloys are used so extensively.
- Cite three characteristics of ferrous alloys that limit their utilization.

Question 2:

A structural member 100 mm long must be able to support a load of 50,000 N without experiencing any plastic deformation. Given the following data for brass, steel, aluminium, and titanium, rank them from least to greatest weight in accordance with these criteria.

Alloy	Yield strength (MPa)	Density (g/cm ³)
Brass	415	8.5
Steel	860	7.9
Aluminium	310	2.7
Titanium	550	4.5

Question 3:

- How can fatigue wear be reduced?
- Why is the abrasive wear resistance of a material a function of its hardness?
- Why is it difficult to use friction sawing on nonferrous metals? Explain.

Question 4:

Give the distinctive features, limitations, and applications of the following alloy groups: titanium alloys, refractory metals, superalloys, and noble metals.

Question 5:

Below is a list of metals and alloys:

Plain carbon steel, Magnesium, Brass, Zinc, Gray cast iron, Tool steel, Platinum, Aluminum, Stainless steel, Tungsten, Titanium alloys.

Select from this list the one metal or alloy that is best suited for each of the following applications, and cite at least one reason for your choice:

- The block of an internal combustion engine
- Condensing heat exchanger for steam
- Jet engine turbofan blades
- Drill bit
- Cryogenic (i.e., very low temperature) container
- As a pyrotechnic (i.e., in flares and fireworks)
- High-temperature furnace elements to be used in oxidizing atmospheres