

## Mechanical Interview Questions updated on Jan 2025

### 1. Explain the second law of thermodynamics.

The entropy of the universe increases over time and moves towards a maximum value.

### 2. What kinds of pipes are used for steam lines?

Normally galvanized pipes are not used for steam. Mild steel with screwed or welded fittings are the norm. Pressure and temperature are very important factors to be considered in what type of materials to be used. Steam even at low pressures can be extremely dangerous.

### 3. What is the difference between shear center flexural center of twist and elastic center?

The shear center is the centroid of a cross-section. The flexural center is the center of twist, which is the point on a beam that you can add a load without torsion. The elastic center is located at the center of gravity. If the object is homogeneous and symmetrical in both directions of the cross-section then they are all equivalent.

### 4. What is ferrite?

Magnetic iron rock

### 5. What is the difference between projectile motion and a rocket motion?

A projectile has no motor/rocket on it, so all of its momentum is given to it as it is launched. An example of a projectile would be pen that you throw across a room.

A rocket or missile does have a motor/rocket on it so it can accelerate itself while moving and so resist other forces such as gravity.

### 6. What is a cotter joint?

These types of joints are used to connect two rods, which are under compressive or tensile stress. The ends of the rods are in the manner of a socket and shaft that fit together and the cotter is driven into a slot that is common to both pieces drawing them tightly together. The tensile strength of the steel is proportionate to the strength needed to offset the stress on the material divided by the number of joints employed.

### 7. What is the alloy of tin and lead?

A tin and lead alloy is commonly called solder. Usually solder is a wire with a rosin core used for soldering. The rosin core acts as a flux.

### 8. What does F.O.F. stand for in piping design?

FOF stands for Face of Flange. A flange has either of the two types of faces:

- a) Raised face
- b) Flat face

The F.O.F is used to know the accurate dimension of the flange in order to avoid the minute errors in measurement in case of vertical or horizontal pipelines.

#### **9. Explain Otto cycle.**

Otto cycle can be explained by a pressure volume relationship diagram. It shows the functioning cycle of a four stroke engine. The cycle starts with an intake stroke, closing the intake and moving to the compression stroke, starting of combustion, power stroke, heat exchange stroke where heat is rejected and the exhaust stroke. It was designed by Nicolas Otto, a German engineer.

#### **10. What is gear ratio?**

It is the ratio of the number of revolutions of the pinion gear to one revolution of the idler gear.

#### **11. What is annealing?**

It is a process of heating a material above the re-crystallization temperature and cooling after a specific time interval. This increases the hardness and strength if the material.

#### **12. What is ductile-brittle transition temperature?**

It is the temperature below which the tendency of a material to fracture increases rather than forming. Below this temperature the material loses its ductility. It is also called Nil Ductility Temperature.

#### **13. What is a uniformly distributed load?**

A UDL or uniformly distributed load is a load, which is spread over a beam in such a way that each unit length is loaded to the same extent.

#### **14. What are the differences between pneumatics and hydraulics?**

- a) Working fluid: Pneumatics use air, Hydraulics use Oil
- b) Power: Pneumatic power less than hydraulic power
- c) Size: P components are smaller than H components
- d) Leakage: Leaks in hydraulics cause fluid to be sticking around the components. In pneumatics, air is leaked into the atmosphere.
- e) Pneumatics obtain power from an air compressor while hydraulics require a pump
- f) Air is compressible, hydraulic oil is not

#### **15. What is enthalpy?**

Enthalpy is the heat content of a chemical system.

#### **16. What is a positive displacement pump?**

A positive displacement pump causes a liquid or gas to move by trapping a fixed amount of fluid or gas and then forcing (displacing) that trapped volume into the discharge pipe. Positive displacement pumps can be

further classified as either rotary-type (for example the rotary vane) or lobe pumps similar to oil pumps used in car engines. These pumps give a non-pulsating output or displacement unlike the reciprocating pumps. Hence, they are called positive displacement pumps.

### **17. Why would you use hydraulics rather than pneumatics?**

Hydraulics is suitable for higher forces & precise motion than pneumatics. This is because hydraulic systems generally run at significantly higher pressures than pneumatics systems. Movements are more precise (repeatable) because hydraulics uses an incompressible liquid to transfer power whilst pneumatics uses gases. Pneumatic systems have some advantages too. They are usually significantly cheaper than hydraulic systems, can move faster (gas much less viscous than oil) and do not leak oil if they develop a leak.

### **18. What is isometric drawing?**

It is a 3-D drawing used by draftsmen, architects etc

### **19. What are the advantages of gear drive?**

In general, gear drive is useful for power transmission between two shafts, which are near to each other (at most at 1m distance). In addition, it has maximum efficiency while transmitting power. It is durable compare to other such as belts chain drives etc. You can change the power to speed ratio.

Advantages: -

It is used to get various speeds in different load conditions.

It increases fuel efficiency.

Increases engine efficiency.

Need less power input when operated manually.

### **20. Which conducts heat faster steel copper or brass?**

Copper conducts heat faster than steel or brass. Any material that is good for conducting heat is also good for electricity in most cases. Wood terrible for transferring heat thus is also insulator for electric.

### **21. How pipe flanges are electrically insulated?**

Pipe flanges are protected from corrosion by means of electrolysis, with dielectric flanges. The piping system is electrically insulated by what is called a sacrificial anode. A bag of readily corrodible metal is buried in the ground with a wire running from the pipe to the bag so that the sacrificial anode will corrode first. If any electrical current charges the pipe, it also serves as a ground.

### **22. What is a Process Flow Diagram?**

A Process Flow Diagram (or System Flow Diagram) shows the relationships between the major components in the system. It also has basic information concerning the material balance for the process.

### **23. Where pneumatic system is used?**

Any system needs redundancy in work needs pneumatics, because the compressor of the pneumatic system has periodical operations (intermittent work, not as hydraulic pump). The compressed air could be accumulated in tanks with high pressures and used even if the compressor failed.

#### **24. Why gas containers are mostly cylindrical in shape?**

The most efficient shape for withstanding high pressure is a sphere but that would be costly to manufacture. A cylinder with a domed top and a domed bottom (look underneath, the flat base is actually welded around the outside, the bottom of the gas container is actually domed) is a much cheaper shape to manufacture whilst still having good strength to resist the internal gas pressure.

#### **25. How is martensite structure formed in steel?**

Martensite transformation begins when austenite is cooled below a certain critical temperature, called the martensite start temperature. As we go below the martensite start temperature, more and more martensite forms and complete transformation occurs only at a temperature called martensite finish temperature. Formation of martensite requires that the austenite phase must be cooled rapidly.

#### **26. What is an orthographic drawing?**

Orthographic projections are views of a 3D object, showing 3 faces of it. The 3 drawings are aligned so that if the page were folded, it would create part of the shape. It is also called multiview projections. The 3 faces of an object consist of its plan view, front view and side view. There are 2 types of orthographic projection, which are 1st angle projection and 3rd angle projection.

#### **27. What is representative elementary volume?**

Smallest volume over which measurements can be made that will yield a representative of the whole.

#### **28. Why are LNG pipes curved?**

LNG pipes are curved because LNG is condensed gas (-164 deg cel) so it can expand the pipes that is what engineers designed the LNG pipes are curve type.

#### **29. What does angular momentum mean?**

Angular momentum is an expression of an objects mass and rotational speed. Momentum is the velocity of an object times it is mass, or how fast something is moving how much it weigh. Therefore, angular momentum is the objects mass times the angular velocity where angular velocity is how fast something is rotating expressed in terms like revolutions per minute or radians per second or degrees per second.

#### **30. Can you use motor oil in a hydraulic system?**

Hydraulic fluid has to pass a different set of standards than motor oil. Motor oil has tackifiers, lower sulfur content, and other ingredients that could prove harmful to the seals and other components in a hydraulic system. If it is an emergency only should you do it.

**31. What causes white smoke in two stroke locomotive engines?**

That is the engine running too lean (lack of fuel). This condition will lead to overheating and failure of the engine.

**32. What is the role of nitrogen in welding?**

Nitrogen is used to prevent porosity in the welding member by preventing oxygen and air from entering the molten metal during the welding process. Other gases are also used for this purpose such as Argon, Helium, Carbon Dioxide, and the gases given off when the flux burns away during SMAW (stick) welding.

**33. What does Green field project mean?**

Green field projects are those projects, which do not create any environmental nuisance (pollution), follows environmental management system and EIA (environment impact assessment). These projects are usually of big magnitude.

**34. Is it the stress that, produces strain or strain produces stress?**

A Force applied to an object will cause a displacement. Strain is effectively a measure of this displacement (change in length divided by original length).

Stress is the Force applied divided by the area it is applied. (E.g. pounds per square inch)

Therefore, to answer the question, the applied force produces both Stress and Strain Stress and Strain are linked together by various material properties such as Poisson's ratio and Young's Modulus.

**35. How does iron ore turn into steel?**

To make Steel, Iron Ore is refined into iron and all the carbon is burned away using very high heat (Bessemer). A percentage of Carbon (and other trace elements) are added back to make steel. 36. What is knurling? Knurling is a machining process normally carried out on a centre lathe. The act of Knurling creates a raised criss-cross pattern on a smooth round bar that could be used as a handle or something that requires extra grip.

**37. What is the mechanical advantage of a double pulley?**

It only takes half the effort to move an object but twice the distance.

**38. What is extruded aluminum?**

Extrusion is the process where a metal or a metal bar is pulled through a mandrel to elongate it and/or give it a final shape.

Extruded Aluminum is a common form of making small aluminum wire, bars or beams and many varieties of small non-structural, decorative pieces.

**39. What is a Newtonian fluid?**

A Newtonian fluid possesses a linear stress strain relationship curve and it passes through the origin. The fluid properties of a Newtonian fluid do not change when any force acts upon it.

**40. What are the points in the stress strain curve for steel?**

Proportional limit, elastic limit or yield point, ultimate stress and stress at failure.

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