**10. SHAFTS**

**SHAFT:** A Shaft is a cylindrical machine element which is used to support the transmission elements for the transmission of power. Shafts are made of ductile material.

**Power Transmitting Elements:** 1) Gear, 2) Sprocket, 3) Pully

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| **TYPES OF SHAFT** | |
| Stationary Shaft | Rotating Shaft |
| 1. Axle: Shaft At rest. Subjected to bending. Zero Twisting. | 1. Counter Shaft: Opposite Direction Motion 2. Jack Shaft: 3. Spindly: Short in length. |

**SHAFTS SUBJECTED TO DIFFERENT LOADS:**

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| **Loading Condition** | **Solid Shaft** | **Hollow Shaft** |
| **Axial Loading** |  |  |
| **Bending Moment** |  |  |
| **Twisting Moment** |  |  |
| **Where,** d = Shaft Diameter | = Outer Diameter of Shaft | = Inner Diameter of Shaft |

**DESIGN OF SHAFT**

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| **UNI-DIRECTIONAL LOADING** | |
| **Pure Normal Stress Condition Design** | **Pure Shear Stress Condition Design** |
|  |  |
| **BI-DIRECTIONAL LOADING** | |
| 1. **Strength Based Design:**   And   |  |  |  | | --- | --- | --- | | **MPST** | **MSST** | **DET** | |  |  |  | |  |  |  |  1. **Stiffness Based Design:** | |

**ASME THEORY:**

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| and represents combined shock and fatigue load factors in bending and twisting. | For No Keys,  For No Keys, |