



# MECHANICAL ENGINEERING SCIENCE

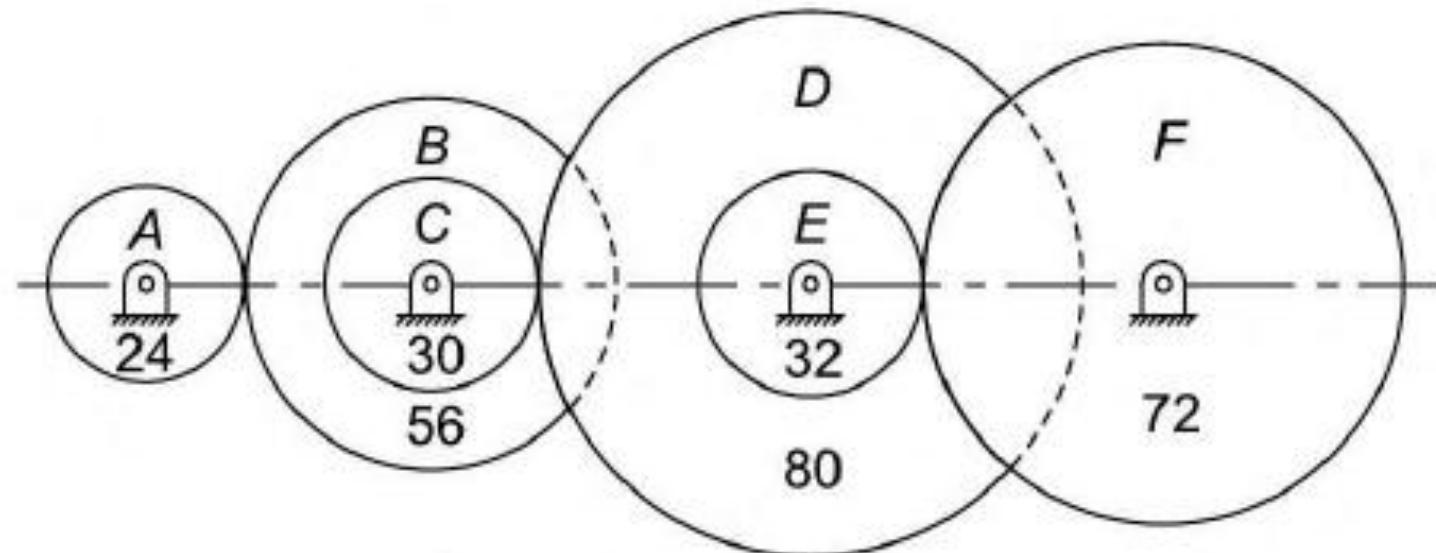
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**Numerical on Gear Trains**

A compound gear train shown in the figure consists of compound gears B – C and D – E. All gears are mounted on parallel shafts. The motor shaft rotating at 800 rpm is connected to the gear A. The number of teeth on gears A, B, C, D, E and F are 24, 56, 30, 80, 32 and 72 respectively. Determine the speed of the gear F.



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## **GEAR DRIVES**

### **Numericals**

### **Solution**

$$\frac{N_F}{N_A} = \frac{T_A}{T_B} \times \frac{T_C}{T_D} \times \frac{T_E}{T_F} = \frac{24}{56} \times \frac{30}{80} \times \frac{32}{72}$$
$$= 0.07143 \text{ or } N_F = 0.07143 \times 800 = 57.14 \text{ rpm}$$

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A compound gear train consists of 4 gears: Gear A (driver) has 20 teeth and rotates at 600 rpm clockwise. Gear B (mounted on the same shaft as Gear C) has 40 teeth. Gear C meshes with Gear D and has 20 teeth. Gear D (driven) has 60 teeth.

Find:

1. The speed of Gear D
2. The direction of rotation of Gear D

Speed relation between A and B

Using gear ratio:

$$\frac{N_B}{N_A} = \frac{T_A}{T_B} \Rightarrow N_B = N_A \times \frac{T_A}{T_B}$$

$$N_B = 600 \times \frac{20}{40} = 300 \text{ rpm}$$

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## POWER TRANSMISSION

### Speed of C

Since B and C are **on the same shaft**:

$$N_C = N_B = 300 \text{ rpm}$$

Speed relation between C and D

$$\frac{N_D}{N_C} = \frac{T_C}{T_D} \Rightarrow N_D = N_C \times \frac{T_C}{T_D}$$

$$N_D = 300 \times \frac{20}{60} = 100 \text{ rpm}$$

Direction of Rotation:

- A = **clockwise**
- B = **counter-clockwise**
- C = **counter-clockwise**
- D = **clockwise**

# MECHANICAL ENGINEERING SCIENCE

## POWER TRANSMISSION

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1. Three gears are in mesh:

- Gear A has 20 teeth
- Gear B has 40 teeth
- Gear C has 30 teeth

If Gear A (driver) rotates at 600 rpm, and Gear C is the driven, calculate the speed of Gear C. Assume all gears are external and Gear B is an idler.

2. In a compound gear train:

Gear A (driver): 20 teeth

Gear B (on same shaft as C): 40 teeth

Gear C: 25 teeth

Gear D (driven): 50 teeth

If Gear A rotates at 1000 rpm, find the speed of Gear D.

# THANK YOU

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