Q 1. You are designing a vehicle drive train system and you have an engine/EM with 100kW power.

Consider:

- Vehicle has zero clutch and drive shaft losses.
- Vehicle has only friction and churning losses.
- Vehicle has 5 speed transmission.
- Vehicle has an open differential.
- Vehicle is driving in a straight line.

Calculate the power at the wheel hub after friction losses in transmission.

Efficiency of different gears:

- External Gearing 0.985
- Planetary 0.98
- Bevel 0.98

Windage Losses and Oil Churning Approx. 15-20%

Solution:

Engine Power= 100kW = 100000W

Efficiency after External Gearing= 100000 * 0.985 = 98500 W

Efficiency after Planetary Gearing= 98500 * 0.98 = 96530 W

Efficiency after Bevel Gearing= 96530 * 0.98 = 94599.4 W

Assuming Windage & Oil churning losses = 15 %

Final efficiency = 95599.4 * (1-0.15) = 80409.49 W = **80.4 kW**