

EXERCISES 1

Transmission

- 1- A vehicle has a hub reduction in which the annulus is attached the axle casing. If the annulus has 60 teeth and the planet pinions 16 and the sun pinion is making 50 rev/min, at what speed is the road wheel driven?
2. A two-start worm drives a worm-wheel with 40 teeth which drives a recovery vehicle's winch drum of 15 cm diameter. The effort handle in the form of a cranked lever has an effective length of 33 cm. If the effort applied is 168 N and the efficiency 67%, what load may be lifted?
3. The rev/min of the output shaft of the train of gears shown Fig. 5.74 is to be 120 when the input shaft is making 1600 rev/min. How many teeth has pinion D?
4. The reduction gear for a recovery vehicle winch consists of a series of pinions as shown in Fig. 5.75. The number of teeth on the pinions are: A = 16, B = 31, C = 54, D = 18, and E = 68. The input rev/min at A are 800 in a clockwise direction. Calculate the rev/min at output E and the direction of rotation, viewing in the direction of the arrow.
5. A vehicle is being propelled in second gear by a tractive effort of 2.86 kN. The effective diameter of the road wheels is 0.62 m. Second gear ratio is 2.75:1 and final drive 4.37:1. The road wheels are making 167 rev/min. Determine the power being produced by the engine if the transmission losses amount to 23%.
6. An engine producing 36 kW power at 2560 rev/min is the power unit for a car which is in third gear of 1.26:1 ratio, Final drive ratio is 4.79:1. The rolling radius of the road wheels is 0.26 m. Find the tractive effort when the transmission efficiency is 74%.
7. A complete rear axle was under an efficiency test in a college laboratory. The input pulley diameter was 350 mm and the external diameter of the wheel hubs 246 mm. The following data were recorded: revolutions of input pulley = 14.25, input load 21 N, revolutions of both wheel hubs = 3, output load 134 N. Determine the overall efficiency of the axle.
8. The total force applied to the rim of a steering wheel was 62 N which produced an output torque of 201 N m. The reduction ratio was 16.6:1 and the efficiency 72%. Calculate the steering wheel diameter.
9. A vehicle in second gear of 2.33:1 ratio is developing a torque of 1150 N m at the final drive crown wheel. The 2 liter four-stroke engine is developing a bmep of 630 kN/m². Assuming a transmission efficiency of 84%, find the final drive reduction ratio.
10. A steering wheel is 62 cm in diameter and the reduction ratio 22.3:1. The overall efficiency is 69% and the effort applied to the steering wheel is 42 N. Calculate the steering torque.

11. The engine of a truck is making 2340 rev/min when a gearbox ratio of 2.78:1 and final drive ratio 5.36:1 are employed. If the near-side wheel is making 26 rev/min, at what speed is the outer wheel rotating?

12. An effort of 67 N is applied by a driver to the 650 mm diameter steering wheel. The overall efficiency of the steering unit is 73%. What ratio is used in the system if the steering torque is 268 N m?

13. A vehicle is negotiating a road curve. The inner wheel is making 156 rev/min. and the outer wheel 198 rev/min. The final drive ratio is 5.74:1, and gearbox ratio engaged 2.76:1. The engine torque at this moment is 132 Nm. Determine the power the engine is developing in kW.

1) A single-plate clutch with a external and internal lining radius of 0.12 m and 0.08 respectively. The total spring force = 2.5 kN and the coefficient of friction is 0.3. The maximum torque which the clutch can transmit is

(a) 75 N m (b) 150 N m (c) 750 N m (d) 1500 N m

2) For the clutch referred to in question 1 above, the power that can be transmitted at a speed of 35 rev/s is

(a) 275 W (b) 550 W (c) 16.5 kW (d) 33 kW