Collins Engineering Physics Questions – C3E

10. A car has an indicated power of 100 kW. Its measured power output is 75 bhp. Calculate the frictional power.
1 horsepower = 1 bhp = 746 W

11. A typical car has a measured torque of 147 N m when the engine is rotating at 4000 rpm. The power from the engine was calculated theoretically as 110 kW. Use this information to calculate

    a. the output power of the car

    b. the frictional power.

12. The indicated power for a four-stroke engine is 200 kW. The car's output power was then measured. It was rotating at 3000 rpm during the test and the torque measured was 290 N m. Calculate the frictional power of the engine.

14. A heat engine operates between 400 °C and room temperature (20 °C). Calculate the maximum theoretical efficiency.

15. An ideal heat engine operating between 17 °C and 777 °C performs 2500 J of work every cycle, which takes 0.10 s.

    a. What is the maximum theoretical efficiency of the engine?

    b. Calculate the amount of energy per cycle that is being extracted from the high-temperature source.

    c. Calculate how much heat energy, per cycle, is rejected.

    d. Calculate the average power of the engine.

16. a. A refrigerator maintains an internal temperature of 2 °C, while the outside ambient temperature is 25 °C. Calculate the COP.

    b. The same refrigerator is operating in a hotter climate, where the ambient temperature is 35 °C. Calculate the new COP.

    c. Comment on these different values.

17. A freezer is maintaining an internal temperature of − 5 °C. The room it is working in is at 20 °C. Calculate the COP.

18. a. A heat pump extracts heat from a river at 3 °C and delivers it into a room at 20 °C. Calculate the COP.

    b. The same heat pump now extracts heat from a river at 10 °C and delivers it into a room at 20 °C. Calculate the COP in this case.

    c. The same heat pump is now used to extract heat from the ground at − 5 °C and delivers it into a room at 20 °C. Calculate the COP.

    d. What pattern do you see? Explain this.