

Homework 1

- Question 1: A tractor is traveling at 5 mph while pulling a ripper that exerts a force of 12000 lb.
- Calculate the drawbar power.
 - If 65% of the power available at engine flywheel is available at the drawbar, determine the Engine Brake Power required to pull this ripper under these conditions.
 - If the mechanical efficiency of the engine is 0.75 and indicated thermal efficiency of the engine is 0.55, determine the fuel consumed operating 8 hours in the field under these conditions. (You may assume $H_g = 19000$ BTU/lb fuel)
- Question 2: An four-cycle engine is tested on a dynamometer. The engine is running at 2400 rpm and the load torque is 600 N.m. The engine consumes 31 liters/h of fuel. The fuel density is 836 kg/m^3 and the higher heating value of the fuel H_g is 45000 kJ/kg.
- Calculate the brake power.
 - Determine the fuel equivalent power.
 - Calculate the brake specific fuel consumption.
 - Determine the brake thermal efficiency.
- Question 3: An four cycle engine with a displacement of 10.4551 produces 670 N.m of torque at a speed of 2100 rpm. A pressure transducer was used to measure the indicated mean effective pressure which was 1000 kPa.
- Calculate the indicated power.
 - Calculate the brake power.
 - Calculate the friction power.
 - Determine indicated mean effective pressure.
 - Determine brake mean effective pressure.
 - Determine friction mean effective pressure.
 - Consider if a two-cycle engine was used instead of the four-cycle engine. If the indicated mean effective pressure was identical at 2100 rpm. Would the two-cycle engine indicated power be twice or half that of the four-cycle engine? Give your reason.
 - For the following parameters which can be physically measured and which can only be calculated from other measured parameters; indicated power, brake power, friction power, indicated mean effective pressure, brake mean effective pressure and friction mean effective pressure.
- Question 4: During a test, a four-cycle engine with a displacement of 955 in^3 , consumes 19 gal/h of diesel fuel while running at 2100 rpm, producing a torque of 870 ft.lb. Then a motoring dynamometer was used turn the engine at 2100 rpm, without the engine firing. The torque required to turn the engine was 165 ft.lb. Given that the fuel density was 7 lb/gal and the heating value of the fuel was 19500 BTU/lb.
- Calculate the fuel equivalent power.
 - Calculate the indicated power.
 - Calculate the brake power.
 - Calculate the friction power.
 - Calculate the indicated thermal efficiency, the mechanical efficiency and the brake thermal efficiency.
 - Determine Brake Specific Fuel Consumption.
- Question 5: An four-cycle engine with a displacement of 5.8661, consumes 19 kg/h of fuel and 413 kg/h of air running under full load at 2400 rpm. The ambient density of air during the test was 1.22 kg/m^3
- Calculate the theoretical air consumption.
 - Determine the volumetric efficiency.
 - The Air to Fuel Ratio.
 - If you had to guess, do you think this is naturally aspirated (no turbo charger) or turbo charged engine? Explain your reason.