

UNIVERSITY OF NAIROBI
FME 321 – THERMODYNAMICS II
TUTORIAL SHEET I

1. A diesel engine consumes 0.0504 kg of fuel per second and develops 624 kW. The calorific value of the fuel is 44,000 kJ/kg.

Determine:

- i. The thermal efficiency (28.1%)
- ii. The heat rejected: (1,593.5kW)

2. A steam power plant has a thermal efficiency of 23 %. The plant produces 30,000 kW of electrical energy.

What is the quantity of heat supplied? (13,034.8 kW)

3. A Carnot engine develops 74.6 kW and operates between 560°C and 4°

Determine:

- i. The thermal efficiency (0.667)
- ii. The heat supplied (111.84)
- iii. The heat rejected (37.24)

4. Develop the expression for the thermal efficiency of an engine working on the Carnot cycle, in terms of its temperature limits.

An engine using air (Assume $\gamma = 1.4$) as the working medium is assumed to work on the Carnot cycle between the temperature limits 365°C, and 26°C and between the pressure limits of 100 bar and 1.0 bar.

Determine:

- i. The pressure at the end of the isothermal expansion (14.7 bar)
- ii. The work done during the cycle (243.2)
- iii. The Thermal efficiency (53.1%)

5. A heat pump, which is a reversed heat engine, takes in heat from a reservoir at 4°C and delivers it to a reservoir at 77°C. The work input to the heat pump is from a reversible heat engine which receives heat from a reservoir at 1095°C and rejects heat to the reservoir at 77°C.

If the total amount of heat supplied to the reservoir at 77°C is to be 105.5kW, find the heat to be supplied from the reservoir at 1095°C. (39.45 W).