**Exercise A)**

DATA :

| | |
|---|---|
| Cylinders | : 4 |
| Engine total volume (4-stroke) | : 2 L |
| Fuel | : **natural gas** (34 MJ / $m^3$) |
| Air-fuel ratio (**volume**) | : 9 (A/F-volume) |
| Compression ratio | : 10 |
| Brake power | : 50 kW (=effective) |
| Indicated thermal efficiency | : 35% (fuel => piston) |
| Mechanical efficiency | : 80% (piston=>crankshaft) i.e. minus the friction losses |
| Volumetric efficiency | : 70% (real air intake vs. theor. displacement volume) |

QUESTION :

Find the engine speed (rpm) under these conditions

**Exercise B)**

DATA :

| | | |
|---|---|---|
| Cylinders | : | 4 |
| Fuel LHV (**Diesel**) | : | 42 MJ / kg |
| Bore | : | 120 mm |
| Stroke | : | 100 mm |
| Air density | : | 1.15 kg/$m^3$ |
| Air-fuel ratio (**mass**) | : | 15 (A/F-mass) |
| Engine speed (4-stroke) | : | 2000 rpm |
| Brake power | : | 60 kW |
| Brake thermal efficiency | : | 30% |
| Mechanical efficiency | : | 80% |

QUESTIONS :

Calculate

1) Fuel consumption (kg/s)
2) Air consumption (L / s)
3) Volumetric efficiency (%)
4) Brake mean effective pressure (bar)
5) Mean piston speed (m/s)