

INTRODUCTION TO ENGINE LABORATORY RESEARCH ENERFT1001, 1 ECTS

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The exercises



Exercise 1 – total 7 points

FUEL LABORATORY



- ▶ Question 1: Why is it important to know the metal contents of fuel?
- ▶ Question 2: Which are the properties that tell about the biofuel ageing?
Mention three properties.
- ▶ Question 3: What is the requirement for diesel fuel flash point set in European diesel standard?

Exercise 2 – total 12 points

ENGINE LABORATORY



- ▶ Question 1: What is the significance of measuring nitrogen and carbon oxides in engine exhaust?
- ▶ Question 2: Why does the engine exhaust contain hydrocarbons?
- ▶ Question 3: What kind of effects may the smallest exhaust particles have on human health?
- ▶ Question 4: What kind of instruments are needed for the determination of exhaust particle number? Please, give an example.



Exercise 3 – total 6 points

ENGINE LABORATORY



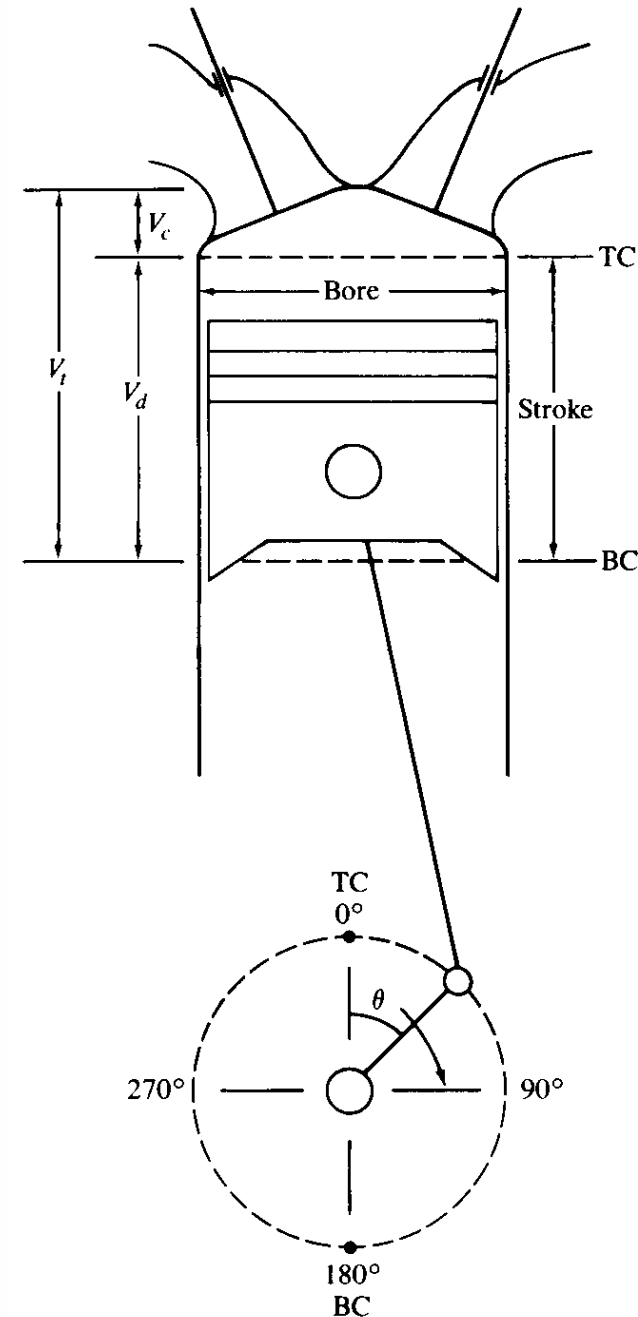
- ▶ The required engine specifications are provided at the virtual environment of the engine laboratory
- ▶ The required formulas and notations are given in the next slide
- ▶ Determine
 - ▶ **The brake mean effective pressure, BMEP (p_e)** of the W4L20 research engine. Give the answer in **bar** unit.
 - ▶ **The mean piston speed (\bar{s}_p)** of the W4L20 research engine. Give the answer in **m/s** unit.



Notations



- ▶ Cylinder bore, B
- ▶ Piston stroke, L
- ▶ Swept volume, V_d
- ▶ Compression volume, V_c
- ▶ Top dead center, TDC (or TC)
- ▶ Bottom dead center, BDC (or BC)
- ▶ Crank angle, ϑ [theta]
- ▶ Brake power, P_b
- ▶ Engine speed, N
- ▶ $n_R = 2$ (4-stroke)
- ▶ $n_R = 1$ (2-stroke)



Formulas



- ▶ Brake mean effective pressure (BMEP), p_e

$$p_e = \frac{P_b n_R}{V_d N}$$

- ▶ Swept volume, V_d

$$V_d = \frac{\pi B^2}{4} \times L$$

- ▶ Mean piston speed

$$\bar{S}_p = 2LN$$

Thank you!

