9.1 Design communication and CAD

Name: _____ Class: _____ Date: _____ **Total: 14 marks**

KEY WORDS assembly drawing • exploded view • bill of materials • parametric modelling • design intent • revision control

Objective

Read an assembly drawing and its parts list, build a part around its design intent so that one change updates the rest, and record a change under revision control.

1 Key knowledge and worked examples

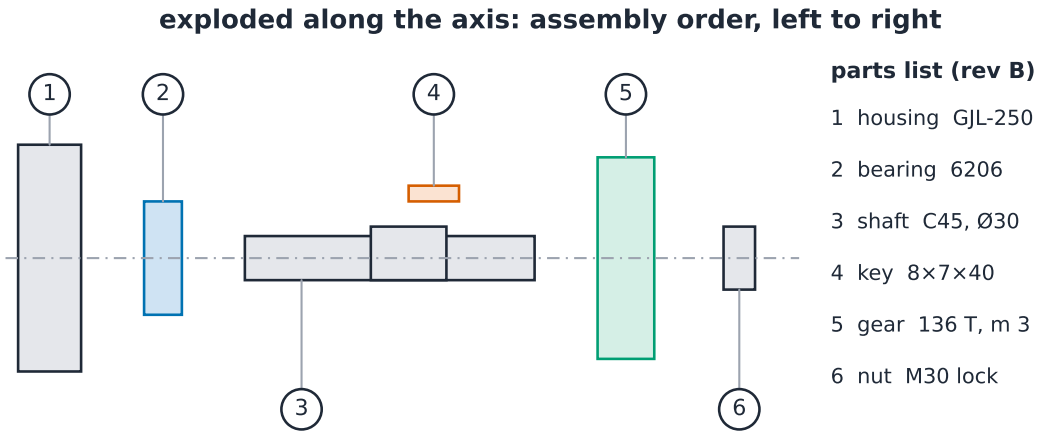
■ Drawings that carry decisions

- An **assembly drawing** or **exploded view** shows how parts go together; **balloons** tie each part to the **bill of materials** (item, part number, quantity, material).
- **Parametric modelling** stores sizes as named, linked parameters; the **design intent** decides which sizes drive and which follow.
- **Revision control**: every released change gets a new letter and a change note (reason, parts, checks, revision).

■ Worked example. Choosing the driving dimensions

- The shaft seats are driven by the 6206 bearing's 30 mm bore; the shoulder by its 36 mm abutment diameter; the gear seat follows the seat.
- Change to a 6207 (35 mm bore, 42 mm abutment): seat, shoulder and gear bore update from **one** parameter.
- A dimension typed in by hand would stay at 30 mm and be found only at assembly.

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2 Practice

2.1 An assembly has one shaft, two bearings, one gear, one key, two circlips and four M8 bolts. Write its bill of materials as a table with item, part and quantity, and give the total number of parts. [3]

2.2 The design is changed to a 6208 bearing (40 mm bore, 47 mm abutment). Which three sizes should follow automatically, and to what values? [3]

2.3 In the model the gear bore was typed as “30” instead of being linked to the seat parameter. Describe what happens after the change of 2.2, and when the error would be found. [2]

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3 Exam-style questions

3.1 The supplier asks to widen the gear face from 30 to 34 mm. Write the change note: the reason, the parts affected (at least three), two checks that must be repeated and why, and the revision action on the drawings. [6]

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Solutions

2.1

- A table with one row per part type: shaft 1, bearing 2, gear 1, key 1, circlip 2, M8 bolt 4.
- Total $1 + 2 + 1 + 1 + 2 + 4 = \mathbf{11}$ parts.

2.2

- Bearing seats **40** mm; shoulder **47** mm; gear bore **40** mm (it follows the seat).

2.3

- The seat grows to 40 mm but the gear bore stays at 30 mm, so the model no longer fits together.
- Nothing warns the designer; it is found at assembly or inspection, the most expensive point.

3.1

- Reason: supplier tooling, face 30 $\rightarrow$ 34 mm.
- Parts: gear, key (longer engagement), spacer or shaft step length.
- Checks: gear bending stress (it falls with the wider face) and the shaft span and bearing reactions, which change if the gear moves.
- New revision letter on every affected drawing, with the old ones withdrawn.

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