9. Machine Design

Starter Quiz ·

University Mechanical Engineering Name: _____ Score: _____

1. Key length L_key = L_hub - 5 after the hub becomes 36 mm (mm)?

   _____ mm

2. Safety factor from 1.2 x 1.15 x 1.1 (two decimals)?

   _____

3. Surface factor k_a = 4.51 x 630^-0.265 (three decimals)?

   _____

4. Revolutions in 20 000 h at 180 rpm (in units of 10^8, two decimals)?

   _____

5. Preload of an M10 8.8 bolt, A_t = 58.0 mm2, S_p = 600 MPa (one decimal, kN)?

   _____ kN

6. Weights in a decision matrix should be fixed:

   ☐ at random

   ☐ after seeing the scores

   ☐ from the brief before scoring

   ☐ by the favourite concept

7. Balloons on an assembly drawing link each part to:

   ☐ the title block only

   ☐ the revision table

   ☐ the bill of materials

   ☐ the tolerance block

8. The cube-mean load is above the plain average because:

   ☐ rare high loads do most of the damage

   ☐ bearings dislike low loads

   ☐ the average ignores time

   ☐ the cube rounds up

9. At the shoulder, which governs?

   ☐ neither

- ☐ buckling
- ☐ fatigue
- ☐ first-cycle yield

10. Doubling a ball bearing's load makes its life:
    - ☐ one half
    - ☐ one quarter
    - ☐ one eighth
    - ☐ the same

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Answers ·

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1. **31 mm**

   36 minus 5.

2. **1.52**

   Multiply the named factors.

3. **0.817**

   Machined surface constants.

4. **2.16**

   180 x 60 x 20 000.

5. **26.1 kN**

   0.75 A_t S_p.

6. **from the brief before scoring**

   Otherwise the matrix only confirms a preference.

7. **the bill of materials**

   Item numbers match BOM rows.

8. **rare high loads do most of the damage**

   Life falls with the cube of the load.

9. **fatigue**

   2.21 is below the yield factor 3.40.

10. **one eighth**

    Life goes as one over P cubed.