

«Introduction to Mechanical Engineering»

Final Exam

Theory part

Question: 1 (8 score)

Variant: 1

1. What does it mean? You should explain each part of this notation (fig. 1) (4 score).
2. Using which 4 basic operations you can design almost any solid part in CAD. Explain your choice with an example (4 score).

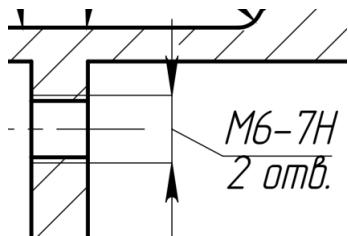


Figure 1: Variant 1.1

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Question: 1 (8 score)

Variant: 2

1. What the difference between lower and higher kinematic pairs and. Provide examples of both types, using kinematic scheme notation (5 score).
2. Draw a kinematic scheme of the mechanism (fig. 2) (3 score).

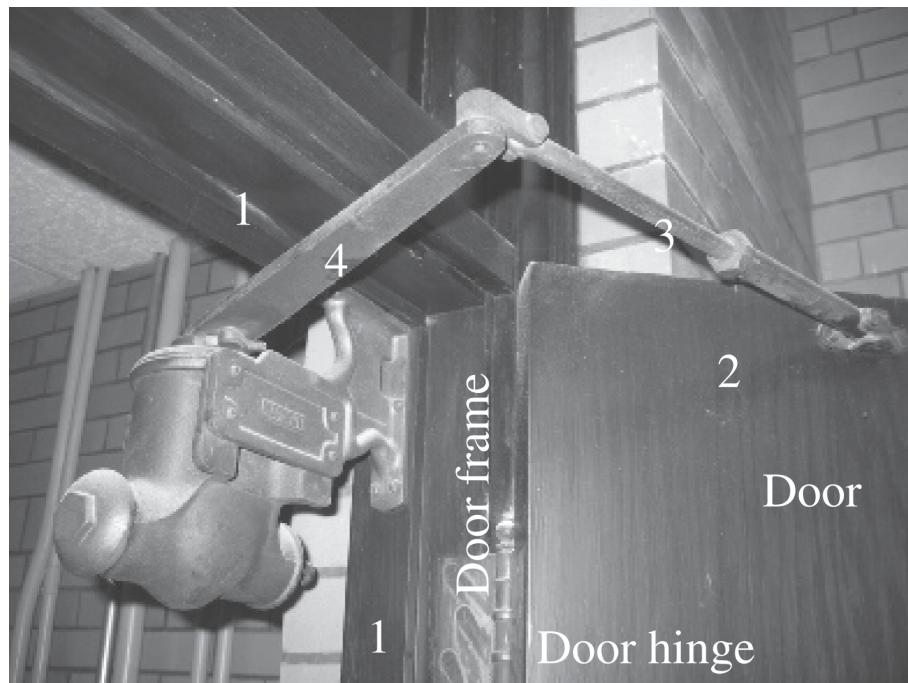


Figure 2: Variant 2.2

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Question: 1 (8 score)

Variant: 3

1. Provide at least 6 types of drives. Prof and cons (8 score).

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Question: 1 (8 score)

Variant: 4

1. Why do we need bearings? (2 score)
2. Explain how linear bearings works. (2 score)
3. How to fix radial bearing on a shaft. At least 2 possible ways. (2 score)
4. Tolerances for mounting, why do we need them? (2 score)

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Question: 1 (8 score)

Variant: 5

1. Could you name all highlighted parts from the picture (fig. 3)? (3 score)
2. What the difference between bolden and direct extruders. (2 score)
3. Could you write the printing process, starting that you have *ideal* CAD model in «step» format. (3 score)

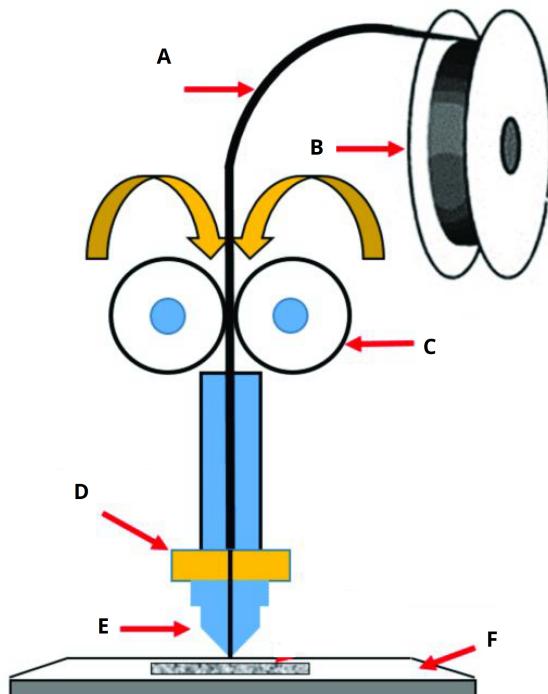


Figure 3: Variant 5.1

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Question: 1 (8 score)

Variant: 6

- What does stress and strain mean? Stress-strain curve. What the idea besides it? Draw some curve for ductile and brittle material. How can we modify a curve behavior for some particular material? (3 score)
- Why do we need alloying elements? Could you provide at least 1 example? (2 score)
- Iron-Carbon Phase Diagram (fig. 4). What can you understand from the diagram? (3 score)

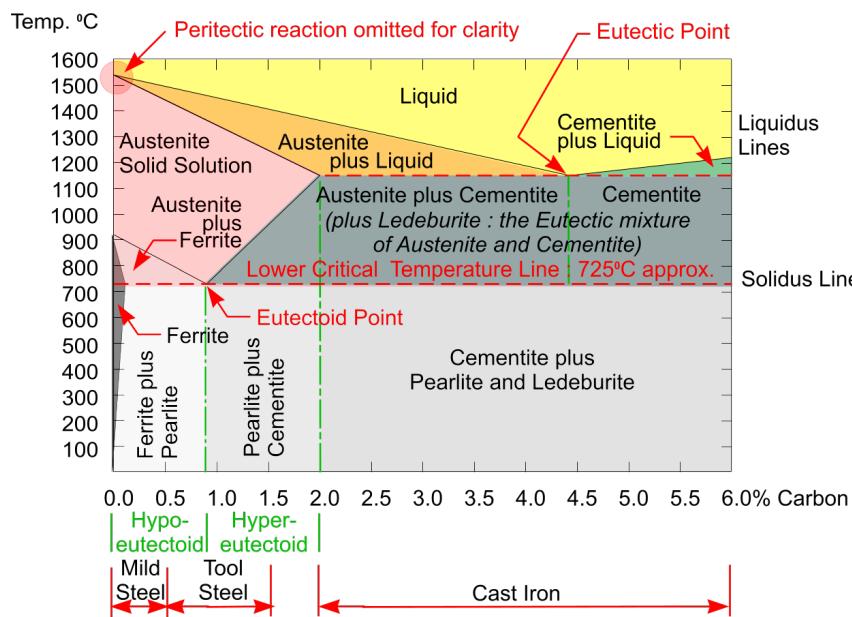


Figure 4: Variant 6.3

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Theory part
Question: 1 (8 score)
Variant: 7

1. Could you name each of type connection on the figure (fig. 5). What the benefits of each of them? (5 score)
2. How to connect two shafts together? Why do we need it? (3 score)

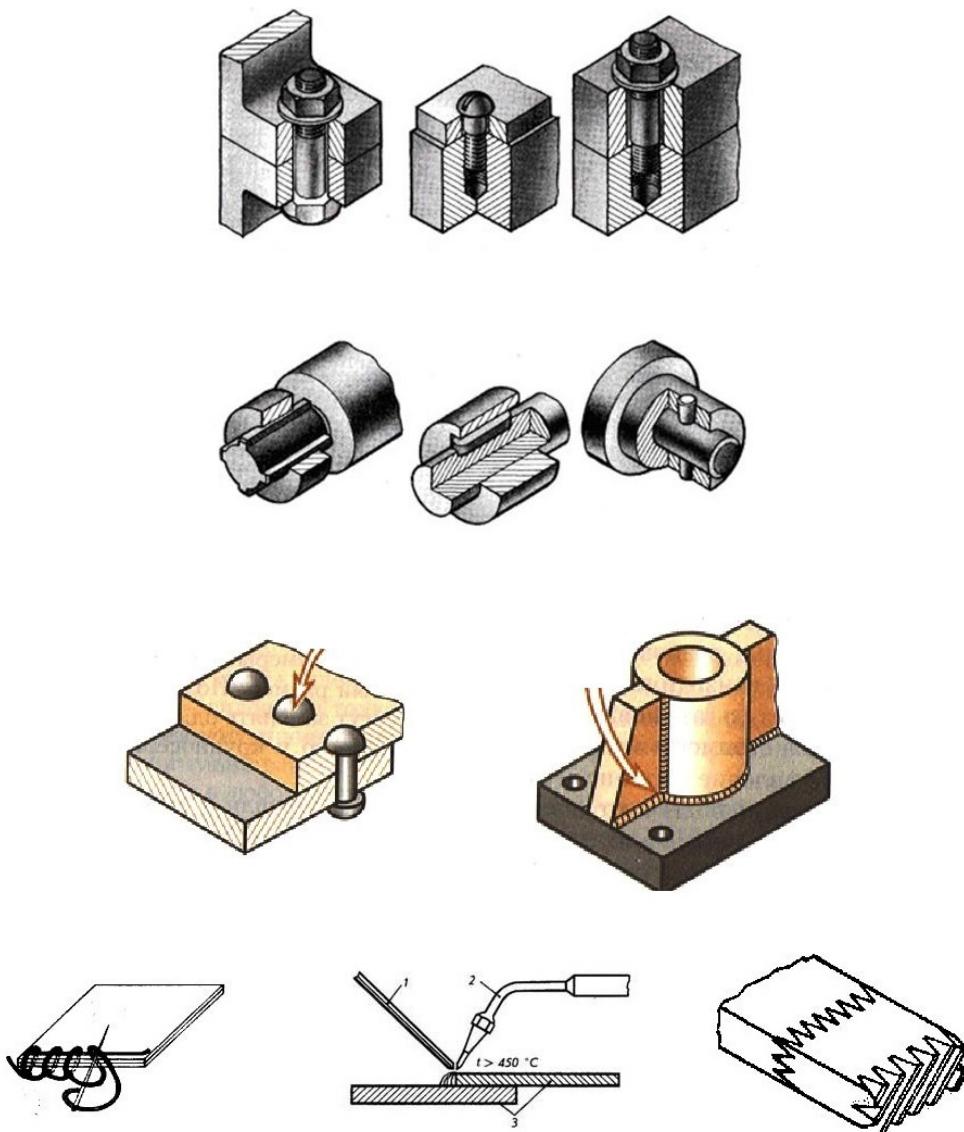


Figure 5: Variant 7.1

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Theory part

Question: 1 (8 score)

Variant: 8

1. What the difference between shaft, spindle and axle? Do we really need different words for them? (2 score)
2. Screw types. Multiple-Start threads, prof and cons. (1 score)
3. Screw drive types (шлицы). Prof and cons. (2 score)
4. Type of drills. Type of holes. How to distinguish them on a blueprints? (1 score)
5. What the conceptual difference between welding and soldering? Provide the example, where it can be used and why. (2 score)

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Theory part

Question: 2 (7 score)

Variant: 1



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Theory part

Question: 2 (7 score)

Variant: 2



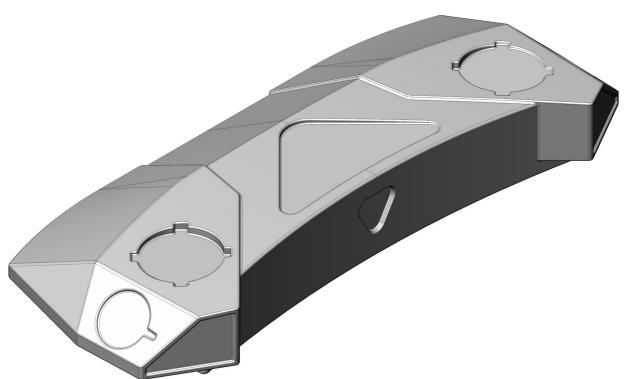
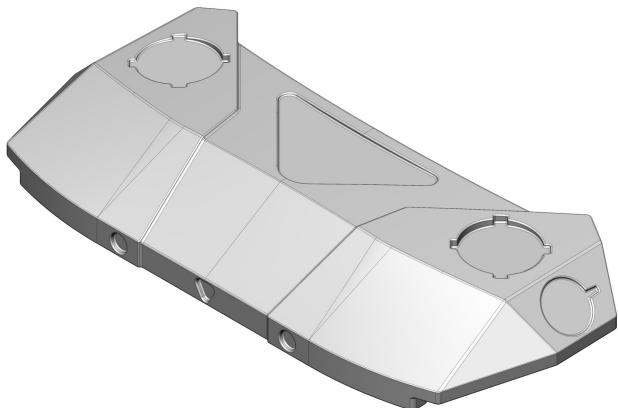
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Theory part

Question: 2 (7 score)

Variant: 3



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Theory part

Question: 2 (7 score)

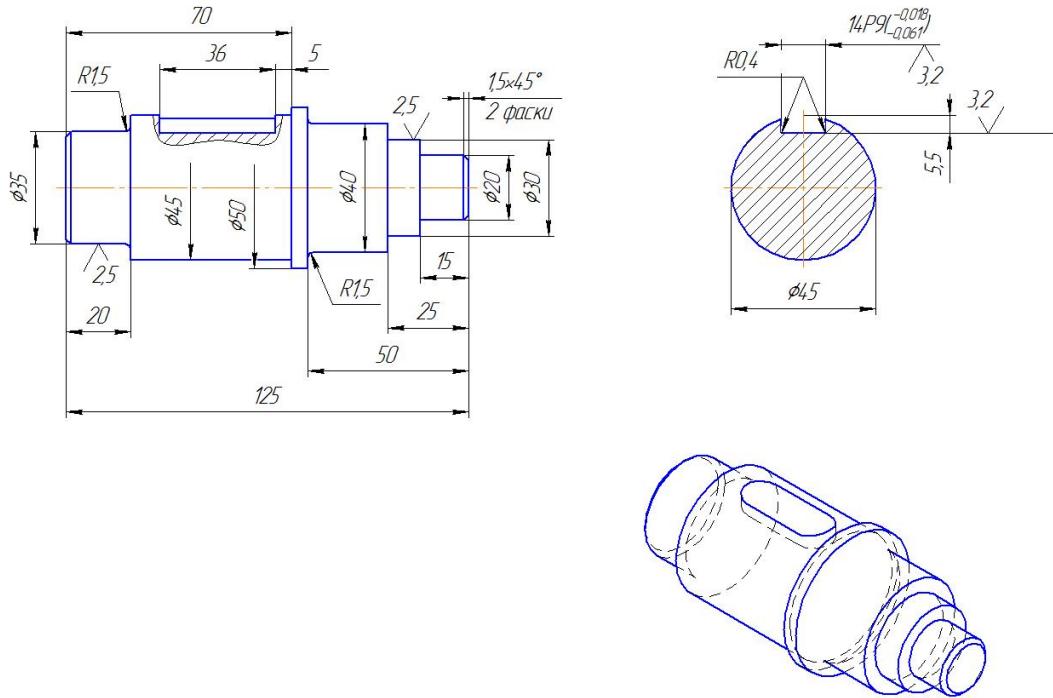
Variant: 4



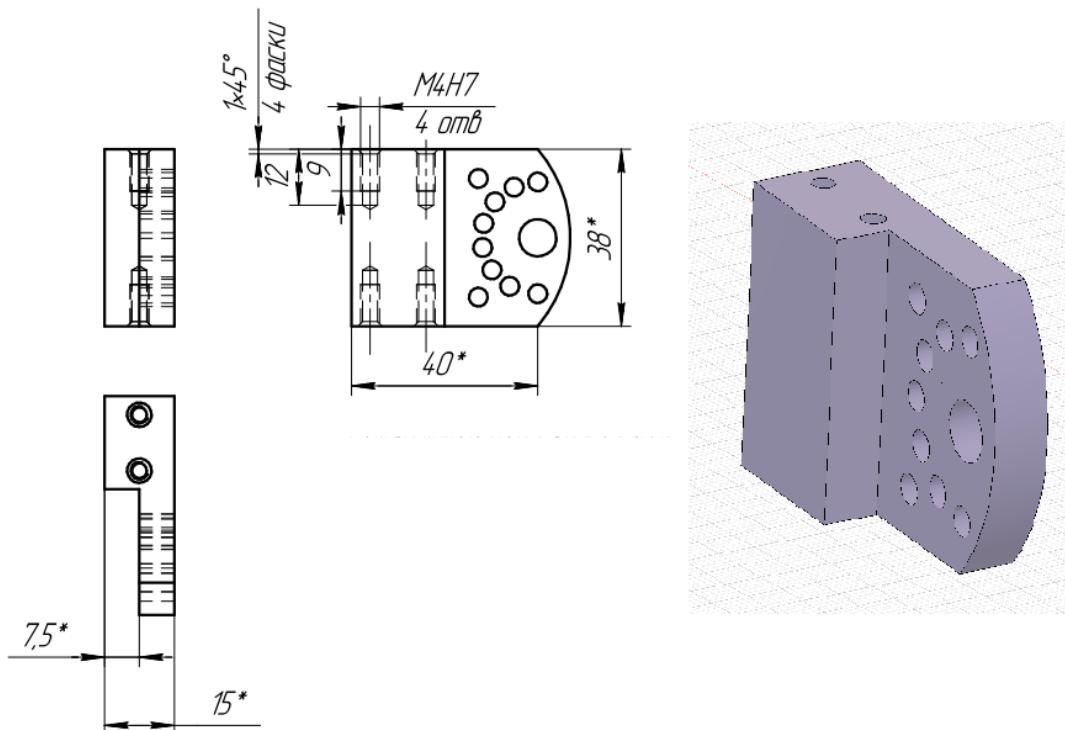
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Theory part
Question: 2 (7 score)
Variant: 5



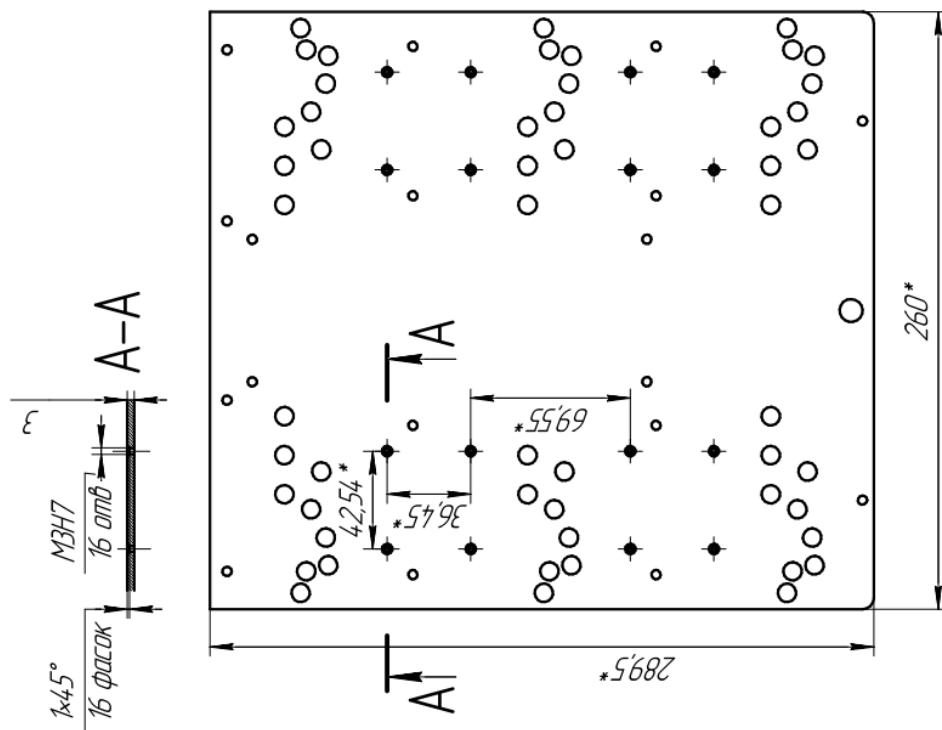
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Theory part
Question: 2 (7 score)
Variant: 6



«Introduction to Mechanical Engineering»
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Theory part
Question: 2 (7 score)
Variant: 7



«Introduction to Mechanical Engineering»
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Theory part
Question: 2 (7 score)
Variant: 8



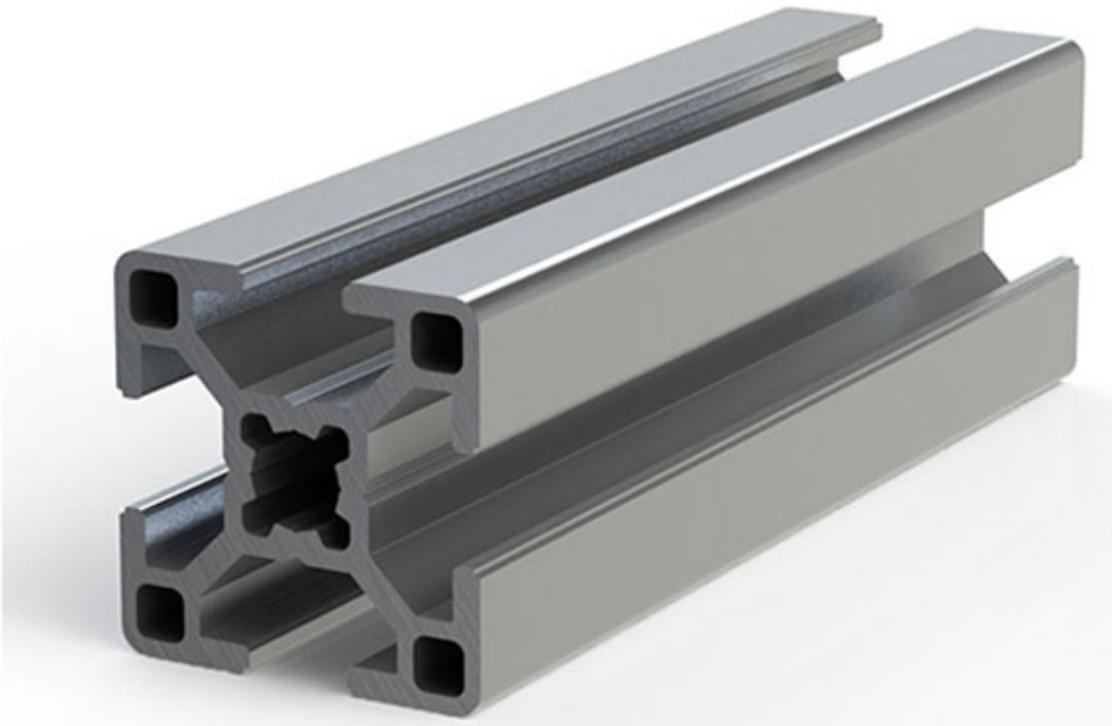
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Theory part

Question: 2 (7 score)

Variant: 9



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Theory part

Question: 2 (7 score)

Variant: 10



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Theory part

Question: 2 (7 score)

Variant: 11



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Theory part
Question: 2 (7 score)
Variant: 12

