

Fundamentals of Structures

Questions 2018 part I

Four of these and similar questions will be put in marked practicals and tests.

Introduction, forces and loads

1. What professionals are members of a building design team?
2. What is the role of the architect in the building design team?
3. What data are necessary to define a force vector in the plane? Sketch an example, and give also the related units!
4. What is a couple (definition, unit)
5. Give examples for variable and permanent loads (at least two-two)!
6. Give a classification of loads and effects according to the origin of them
7. What kind of dynamic loads are there acting on structures?
8. What is the resultant of distributed loads?

K building visit, requirements of buildings, building constructions and building materials

9. What kind of load-bearing structural materials were used for the construction of the K-building? Give also the name of the corresponding loadbearing structure!
10. Give three important dimensions (height, width or length in m) of the K building of BME, which can be related to any functional unit, part or whole of the building or to a building construction!
11. How many internal courts does the K-building of the BME have? What was the main aim by designing them?
12. Describe shortly three space organisational principles followed by designing the arrangement of the different functional units of the central building of the BME!
13. What fundamental and common requirements are to be taken into consideration by design of buildings, building constructions and loadbearing constructions?
14. What kind of different safety requirements are to be considered when designing buildings?
15. Give a list of functionality requirements of spaces in buildings (requirements of human comfort and use)!
16. Give some non-structural requirements of loadbearing structural materials!
17. How can you prove the fulfilment of the economic requirement in building design?
18. Give different safety requirements of loadbearing structures!

Laboratory visit

19. Describe the way of rupture of the concrete specimen tested in the laboratory for compression!
20. We tested in the laboratory among other:

reinforcing steel bar in tension,
concrete in compression and
timber in compression parallel and perpendicular to grains

Give the approximate value of the ultimate strength (the strength measured at rupture) of these tested materials in KN/cm^2 (or N/mm^2)

21. Describe the way of rupture of the steel bar tested in tension!
22. What is approximately the relation of the compression strengths of timber parallel and perpendicular to grains?
23. The test results for a group of same specimens were different. Why?
24. What was approximately the relationship of the strengths of the tested different structural materials: steel (in tension), concrete (in compression) and timber (in compression parallel to grains)?

Mechanical behaviour of structural materials strength evaluation

25. What is stress? Give also the unit of it!
26. What is strain? Give also the unit of it!
27. What is strength? Give also the unit of it!
28. What is a stress-strain diagram! Sketch an example
29. Sketch a linear elastic-completely plastic stress-strain diagram, and indicate on it: the linear-elastic part, the yield point, the completely plastic part and the point corresponding to rupture!
30. Give structural requirements of loadbearing structural materials!
31. What different values of the strength are determined by statistical evaluation of the test results? Which is the mostly safe value?
32. Sketch a rigid-completely plastic stress-strain diagram!
33. Sketch two strength distribution curves: one with greater and one another with smaller scatter!
34. What is the Student factor t in the equation $f_k = f_{\text{nom}} = f_m - tS$ depending from?
Here s is the scatter, f means strength, the indices indicate different values of the strength