Department of strength, materials and structures
Fundamentals of Structures

1st Test questions

A) Definitions

1. (Engineering) Design
2. Architectural design
3. Building
4. Span (definition, unit)
5. Strength (definition, unit)
6. Strain or specific deformation (definition, unit)
7. Modulus of elasticity (definition, unit)
8. Gravitational acceleration (definition, unit)
9. Moment of a force with respect to a point (definition, unit, sign)
10. Couple of forces (definition, unit, sketch)
11. Uniformly distributed load in a plane (definition, unit, sketch)

B) Laws

1. Hooks' law
2. The 2nd law of Newton
3. Variation of length of linear members due to temperature effect

C) Requirements

1. Fundamental requirement of architectural design
2. Fundamental design requirements of components of buildings (spaces and constructions)
3. Detailed content of the fundamental requirement of functionality of buildings
4. Detailed content of the fundamental requirement of safety of buildings
5. Detailed content of the fundamental requirement of aesthetics of buildings
6. You find below four failure modes of loadbearing structures. What is the requirement corresponding to each of the failure modes?
   - -rupture due to tension
   - -buckling
   - -corrosion or fatigue failure
   - -fire collapse

D) Important quantitative data

1. Storey height of the K building of the BME and of family houses in general (m)
2. Approximate characteristic compression strength of the loadbearing structural materials:
   brickwork, timber (parallel to grains), steel, concrete (kN/cm^2)
3. Approximate value of the (characteristic) live load intensity, which is to consider to act onto floor constructions of buildings. You can give from-to range of the intensity, and do not forget to indicate the unit of it!
4. Approximate design value of the (total) load intensity acting onto the load-bearing structure of floor constructions in buildings (intensity and unit)

E) Why-s, reasoning, explanations

1. How can we measure (evaluate) the economic requirement of building design?
2. What do you understand under environment protection requirement of building design?
3. Explain the difference between linear elastic and brittle behaviour!
4. Why do we have to use safety factors to increase the load intensity of both the permanent and variable loads? Do you know the values of them?
5. Explain the difference between normal stress and normal strength!
6. Measured values of the strength of structural materials are statistically evaluated by determining the mean value (f_m), the characteristic value (f_{ch}) and the design value (f_d) of the strength. Which of these values is the greatest, the smallest, and why is it necessary to make this evaluation? Show these values on a strength distribution diagram!

F) Listings, classifications

1. Aims of the course
2. Classification of buildings (according to functions)
3. Fundamental functions of building constructions
4. Fundamental design requirements of constructions of buildings
5. Classification of loadbearing structures (according to load transfer directions)
6. Space organizational design principles of the K building of the BME
7. Main components of buildings
8. Aesthetical expression tools of buildings and constructions
9. Members of the design team of a building
10. Which of the load-bearing structural materials do have negligible tensile strength?
11. What kind of strengths there are?
12. Advantages and disadvantages of applying ceramic bricks as load-bearing structural material
13. What kind of structural materials do you see on the photo?
14. Advantages and disadvantages of timber as a load-bearing structural material
15. Different kinds of iron and steel. Give for each of them the most important characteristic
16. Advantages and disadvantages of applying steel as a load-bearing structural material
17. Advantages and disadvantages of using concrete as a load-bearing structural material
18. Data necessary to define a force in the space
19. Give examples for kinematic and dynamic effects that can act on load-bearing structures!
20. Different kinds and classification of static loads
21. Classification of loads according to distribution
22. Factors influencing the load intensity of:
    - -self-weight of building constructions
    - -live loads
23. Factors influencing the intensity of meteorological loads:
    - -snow load
    - -wind loads

G) Graphical presentations

1. Idealized (simplified) stress-strain diagrams: linear elastic, elastic-completely plastic, rigid-plastic (indicate the 2 axis, axis name and unit, the diagram)
2. Linear elastic-nonlinear stress-strain diagram (indicate the 2 axis, axis name and unit, the diagram)
3. Idealized (simplified) stress-strain diagram of timber, steel and concrete (indicate the 2 axis, axis name and unit, the diagram)
4. Character of the strength distribution curve (indicate the 2 axis, axis name and unit, the diagram)

H) Examples

1. Give 5 examples for material use which contribute to aesthetical outlook of the K building of the BME!
2. Give at least four examples for load-bearing structures used in the K building of the BME! (material, name and function)