Final exam questions

Subject group name: **Finite Element Analysis**

Neptun code: ZVEGEMMNWFE

Credit points: 5

Subject in this subject group:

Finite Element Analysis (BMEGEMMNWFE)

Program: Mechanical Engineering Modelling, MSc (2N-MW0)

Specialization: Solid Mechanics

Responsible person: Dr. András Szekrényes, szeki@mm.bme.hu
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Faculty of Mechanical Engineering

You can check the current subject forms at the Educational Portal of the Faculty of Mechanical Engineering.

https://oktatas.gpk.bme.hu/

Always check the for updates at edu.gpk.bme.hu before preparing for the exam, especially if the subject group contains at least one subject from your final semester!

Valid from 01 September 2021

Dr. András Szekrényes
associate professor

Finite Element Analysis (BMEGEMMNWFE)

1. Linear stability (bifurcation) analysis of elastic systems, Euler's method. Initial stress and perturbed states, field increments. The role of Green-Lagrange strain tensor.

2. The geometric stiffness matrix of the 1D beam element. Interpolation, formulation of the fields, initial stress, and perturbed states.

3. Lateral-torsional buckling of an I-section beam subjected to pure bending. Linear stability analysis, displacement field of the perturbed state, initial stress state, increment in total potential energy.

4. The load stiffness matrix of the 1D beam element with axial force. Stability diagrams of Beck's column, divergence, and flutter.

5. Mathieu type equation of motion for multi-DOF systems with parametric excitation. 2T and T periodic solutions, stability diagrams and time response of a periodically compressed beam.

6. The diverse nature of linear and nonlinear structural problems. Classification of nonlinear structural problems, material, and geometric nonlinearities.

7. The basic idea of the Newton-Raphson and modified Newton-Raphson iteration schemes, graphical solution through a well-behaved 1DoF system.

8. Degenerated elastic 1D beam element for moderately large rotations, von Kármán-type nonlinearity. Formulation of the mechanical fields, stress resultants. Load-displacement curve of beams having immovable ends.

9. Geometrically nonlinear beam for large displacements and rotations. Reference and current configurations. Formulation of the displacement field. Nonlinear load-displacement curves of a cantilever beam subjected to concentrated load and concentrated moment.