

**State questions from subject: Dynamics of mechanical systems**

**Study programme: Mechanical engineering (Bachelor), Study specialization: Mechanical engineering, AY: 2020/2021**

1.
  - a) Dynamic equations of motion for mechanical systems – Lagrange equations of the 2nd kind.
  - b) Types of forces and tasks in mechanics.
2.
  - a) Free vibration of an undamped system with two masses, frequency (characteristic) equation, mode shapes, general solution.
  - b) Analytical statics.
3.
  - a) Forced vibration of a 2-mass system excited by a centrifugal force, derivation of equations for determining amplitudes of forced vibration and their graphical interpretation.
  - b) Multiobjective optimization.
4.
  - a) Semi-active suspension of a planar vehicle model.
  - b) General formulation of an optimization problem.
5.
  - a) Constraints in mechanical systems.
  - b) Principle of an undamped dynamic vibration absorber.
6.
  - a) Kinematic excitation of a system with two masses, derivation of equations for determining amplitudes of forced vibration and their graphical interpretation.
  - b) Dynamic equations of motion for mechanical systems – using free body diagrams.
7.
  - a) Real and virtual motion.
  - b) Principle of a tuned vibration absorber.
8.
  - a) Generalized coordinates and degree of freedom of a mechanical system.
  - b) Passive suspension of a planar vehicle model.
9.
  - a) Vibration of a system with two masses, derivation of equations for determining amplitudes of forced vibration and their graphical interpretation.
  - b) Dynamic equations of motion for mechanical systems – principle of virtual work.
10.
  - a) Optimization of comfort of a planar vehicle model.
  - b) Phases of design of a mechanism with prescribed output motion.
11.
  - a) Constraints of a general optimization problem.
  - b) Stability of equilibrium position, Lyapunov stability theorem.
12.
  - a) Chebyshev objective function for optimization of a mechanism with prescribed output motion.
  - b) Motorcycle dynamic models.



13.
  - a) Natural frequencies and mode shapes of a mechanical system, using MATLAB.
  - b) Gauss objective function for optimization of a mechanism with prescribed output motion.
  
14.
  - a) Vibration of a mechanical system with small amplitudes about a stable equilibrium position.
  - b) Stability of motion of a mechanical system.
  
15.
  - a) Classification of vibration of nonlinear mechanical systems.
  - b) Approximate methods for analysing nonlinear mechanical systems.

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