LTCC
"MORSE THEORY, TOPOLOGY AND ROBOTICS"
EXAM 2022 - 2023

EXAMINER: PROFESSOR MICHAEL FARBER

1.
  - (a) Give the definition of a vector field on a manifold,
  - (b) What is meant by a 1-parameter group of diffeomorphisms,
  - (c) State the theorem about 1-parameter group of diffeomorphisms generated by a vector field.

2.
  - (a) Give the definition of a Morse critical point;
  - (b) State the Morse Lemma;
  - (c) State the theorem about changes in the sub-level set when crossing a non-degenerate critical level.
  - (d) State the Morse inequalities.
  - (e) What is the minimal number of critical points of a Morse function on a closed orientable surface of genus g?

3.
  - (a) Describe a Morse function on $\mathbb{CP}^n$ and find all its critical points.
  - (b) Give the definition of Lusternik - Schnirelmann category.
  - (c) State the category of the sphere S^2, torus T^2, surface of genus 2?

4.
  - (a) Give the definition of a linkage;
  - (b) Describe the configuration space of a planar linkage.
  - (c) What is meant by the length vector of a linkage?
  - (d) When do we say that the length vector is generic?
  - (e) State the theorem about Betti numbers of moduli spaces of planar linkages.