H-spaces

1) **N. Iwase**

   A) Determine the higher associativity of the pull-back of a sphere extension of a Lie group by the degree k mapping.

   B) Find the example of a space which admits an A_n-structure but no A_n-primitive A_n-structure. This is unsolved even if $n = 2$.

   C) Is there a three-connected homotopy associative H-space?

   D) When does the Bar construction functor induce a weak equivalence from the space of homeomorphisms between compact Lie groups to the mapping space between their classifying spaces? This is not always true and not always false.

   E) Justify the equivariant theory (homotopy theory, simple homotopy theory, algebraic K-theory, etc.) for non-compact Lie groups, or make clear the essential obstructions.

2) **J. P. Lin**

   A) Prove a 14-connected finite H-space is acyclic.

   B) Suppose $f: Y \longrightarrow Z$ factors as

   $$Y \xrightarrow{(\overline{\Delta} \wedge 1)\overline{\Delta}} Y \wedge Y \wedge Y \longrightarrow Z,$$

   where Y is an H-space. If X is the fibre of f, does X split as $\Omega Y \times \Omega^1 Z$ as homotopy commutative H-spaces?

   C) Are there any finite loop spaces whose mod 2 cohomology is not the mod 2 cohomology of a Lie group?

   D) Suppose X is a 1-connected finite H-space and $A = H^*(X; \mathbb{Z}_2)$ is the corresponding cohomology Hopf algebra over $A(2)$. Are there "irreducible" Hopf algebras over $A(2)$ such that A splits as the tensor product of irreducible Hopf algebras over $A(2)$?