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|  | **5411 Math** | **King Saud University** |
| **27/4 /2020** | **Final Exam** | **Second Term** |

**Q1:** Prove the followings:

1. Let be a ring with identity. If is a unitary left module then as left modules.
2. If is an exact sequence of right modules over a ring and is a left module then: is an exact sequence of abelian groups.

**Solve 2 of the following questions only:**

**Q2:** Prove the followings:

1. Every free - modules is projective.
2. ) P is a projective module *iff* every short exact sequence of modules

**Q3:** Prove the followings:

1. ) Q is injective *iff* Any short exact sequence of modules splits.
2. The module is injective (prove any theorem you used).

**Q4:**

1. Prove that if   is an exact sequence of modules. Then

is Noetherian   and  are Noetherian.

1. Show that if is a commutative ring with identity, and is an Artinian ring then every prime ideal is maximal.

***Good luck!***