**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**14/16 AHMADU BELLO WAY, VICTORIA ISLAND, LAGOS**

**SCHOOL OF SCIENCE AND TECHNOLOGY**

**JUNE/JULY EXAMINATION**

**COURSE CODE: MTH312**

**COURSE TITLE: Groups and Rings**

**TIME ALLOWED:3 HOURS**

**INSTRUCTION: ANSWER ANY 4 QUESTIONS**

1.(a) Prove that every subgroup of Z is normal in Z - **7 ½ marks**

 (b) Let H be a subgroup of a group G. Show that following statement are equivalent

 (i) H is normal in G

 (ii) 

 (iii)  **10marks**

2.(a)(i) Show that **7½ marks**

(b) Write out the cayley tables for addition in Z6, the set of non-zero elements of Z6. **10 marks**

3. (a) Consider the set G  Ten g is a group with respect to matrix addition.Show that

 is an isomorphism **10 marks**

 (b).(i) Write out the cayley tables for multiplication in Z6, the set of non-zero elements of Z6. **7½ marks**

4.(a) Consider the set  are real numbers. Show that M2 (R) is a ring with respect to

 Addition **10 marks**

 (b) Show that  is a subring of **7½ marks**

5. (a) Prove that  is a non commutative group for  Hint use **10mrks**

 (b) Find the principal ideals of Z10 generated by 3and 5 7 **½ marks**

6.(a) Let X be a non-empty set  be the collection of all subset of X and denote the symmetric difference operation.

 Show that is a ring. **10 marks**

 (b) Consider the ring  and Let Y be a non-empty subset of x . *f* is defined  by 

 in .Show that  *f*  is a hormorphism.**7 ½ marks**