



(Knowledge for Development)

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR
THIRD YEAR SECOND SEMESTER
SPECIAL/ SUPPLEMENTARY EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE
MATHEMATICS

COURSE CODE: MAT 306

COURSE TITLE: GROUP THEORY II

DATE: 11/10/18

TIME: 11.30 AM -1.30 PM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of 2 Printed Pages. Please Turn Over.

QUESTION ONE: COMPULSORY (30 MARKS)

- a) Let $G = S_3$, permutation group on three elements, identify its class equation from the Conjugacy class. (10 marks)
- b) State and prove the Jordan-Holder theorem. (10 marks)
- c) Determine the number of abelian groups of order 72 and show them clearly in a table. (10 marks)

QUESTION TWO (20 MARKS)

- a) Identify all the p-Sylow subgroups of $Z/(12)$ (10 marks)
- b) Show that every group of order p^2 is abelian where p is prime. (10 marks)

QUESTION THREE (20 MARKS)

- a) Identify the elements of 2-Sylow subgroup of $SL_2(Z/(3))$ (10 marks)
- b) Show that for each prime p , the p-Sylow subgroups of G are conjugate. (10 marks)

QUESTION FOUR (20 MARKS)

- a) Identify the conjugate classes of the Dihedral group D_8 , the set of the symmetries of a square, hence write its class equation. (10 marks)
- b) Show a finite group G has a p-Sylow subgroup for every prime p and any p-subgroup of G lies in a p-Sylow subgroup of G . (10 marks)

QUESTION FIVE (20 MARKS)

- a) Define, using relevant examples, the following terms
- i) Conjugacy class (2 marks)
 - ii) Class equation (2 marks)
 - iii) Abelian group (2 marks)
 - iv) P-subgroup (2 marks)
- b) Show how the class equation of the Quaternion group is determined. (8 marks)
- c) State the four Sylow theorems. (4 marks)