Total Marks 25

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PYL743: Group theory and its applications
(I Minor)

August 28, 2016 9:30 AM – 10:30 Noon

Question 1. Let G be a group of order N.

(a) (1 mark) Let the number of distinct classes of G be N. Show that G is abelian.

(b) (2 marks) Show that the set of all elements that commute with a given group element of G forms a subgroup of G.

(c) (2 marks) Show that if $N = 4$, G is necessarily Abelian.

Question 2. Let G be the group of symmetries of a square.

(a) (5 marks) Identify a nontrivial normal subgroup.

(b) (5 marks) Construct its quotient subgroup explicitly. Identify if it is Abelian.
Hint. *Write the group multiplication table*

Question 3. Consider the permutation group S_3.

(a) (7 marks) Identify all its normal subgroups.

(b) (3 marks) Hence deduce the number of distinct homomorphic mappings from S_3 to any other group.

The End