

# ALAGAPPA UNIVERSTIY STUDY CENTRE TUTICORIN

## 1<sup>ST</sup> SEM ASSIGNMENT QUESTION

INTERNAL MARK: 25 / PER SUBJECT

M.Sc. [Mathematics]

### 31111 ALGEBRA – I

1. Prove Basis Representation Theorem
2. Prove that a subgroup H of a group G is normal in G iff  $Hg = H$  for all  $g \in G$ .
3. Prove generalised Cayley's theorem.
4. Prove that every p-subgroup of a finite group G is contained in some Sylow p-subgroup of G.
5. Show that in a Boolean ring R, every prime ideal  $P \neq R$  is maximal.

### 31112 ANALYSIS – I

1. Prove that for all x belongs to R,  $-(-x) = x$ .
2. Discuss metric space with the help of an example.
3. Discuss Alembert's ratio test.
4. Discuss continuous function and limits at infinity.
5. Show that the function f defined by

$$f(x) = \frac{e^{1/x}}{1 + e^{1/x}}$$

If  $x \neq 0$  if  $x=0$  is discontinuous at  $x = 0$

### 31113 ORDINARY DIFFERENTIAL EQUATIONS

1. Solve the following differential equations:  
 $(D^3 - 3D^2 + 2D)y = 0$
2. Discuss the significance of Wronskian equations with regard to non homogeneous equations of order two.
3. Solve  $(D^3 - 3D^2 + 2D)y = 3xe^{2x} + 5x^2$
4. Show that  $11(x^2 - 1)P_5 = 30(P_6 - P_4)$
5. Discuss the method of finding exceptional regular singular points using Frobenius methods.

### 31114 TOPOLOGY – I

1. Check the distributive laws for  $\cup$  and  $\cap$  and DeMorgan's laws.
2. Explain Cartesian product of sets and their properties.
3. Prove that if  $X_1, X_2, X_3, \dots, X_n$  are countable then  $\{X_1 \times X_2 \times \dots \times X_n\}$  is countable.
4. Explain the product topology on  $X \times Y$ .
5. Discuss Bolzano-Weierstrass property and sequential compactness.