

## **Paper 1 Essentials!**

### **Question 1 : Algebra :**

(a) Linear Algebra : You must be able to solve linear equations in one, two and three variables (Simultaneous equations) (b) You must be able to solve inequalities . (c) You must be able to prove and use the factor theorem . (d) You must be able to use the remainder theorem .

### **Question 2: Algebra :**

Quadratic Equations : (a) You must be able to solve a quadratic equation . (b) You must know the rules which connect the roots to the coefficients of a quadratic equation . (c) You must know the conditions for which a quadratic equation has (i) Real, (ii) Unreal, (iii) equal roots . (d) You must be able to solve a difference equation . (e) You must be able to solve an inequality involving indices .

### **Question 3: Matrices /Complex Numbers :**

(a) You must be able to add, subtract, multiply, 2x2 matrices . (b) You must be able to find the inverse of a 2x2 matrix and be able to solve a matrix equation . (c) You must be able to deal with complex numbers both in Cartesian ( $x + iy$ ) form and in Polar form ( $\cos x + i \sin x$ ) . (d) You must be able to solve equations of the form  $x + iy = \sqrt{5 + 12i}$  . Conjugate roots theorem appeared in '99 might be worth a look at

### **Question 4 : Sequences and Series :**

(a) Must know the formulae for  $U_n$  and  $S_n$  of an AP and a GP . (b) Must know  $S_n$  of a GP . (b) To do this question you must be very familiar with all aspects of the properties of AP's, and GP's. Question 4 is the main sequences and series question it often contains an equation in  $u_n$ . see 99, 98, 997, 96 this can be very easy

### **Question 5: Series /Induction/Logs :**

(a) You must be able to prove all of the following by Induction (i) Sums of Series (ii) Inequalities (iii) That a given number is a factor of a given expression , (b) Must be able to solve equations involving Logs . (c) You must be able to use the Binomial expansion, you must be able to use the general term to find specific terms , you must know the properties of Binomial Coefficients . (d) You must be able to

find  $U_n$ ,  $S_n$  and  $S$  of a telescopic type series, You must be able to find  $U_n, S_n, S$  of an APGP.

### **Question 6 :Differential Calculus :**

(a)You must be able to differentiate functions using the product,quotient,and chain rules (b)You must be able to differentiate implicit functions . (c)You must be able to use calculus to find the turning points on a curve .(d)You must be able to find the Asymptotes of a curve .

### **Question 7 : Differential Calculus :**

(a)You must be able to differentiate specific functions from first principals (can appear in Q6orQ7) ;(b)You must be able to use calculus to solve problems involving distance,speed ,time and rate of change problems in general,(c)You must be able to differentiate functions in parametric form .**Newton Raphson** has been a particular favorite in this question in recent years.

### **Question 8 : Integral Calculus :**

(a)You must be able to integrate standard integrals (b)You must be able to use substitutions in particular the  $u$  substitution . (c)You must be able to use integration to find (i)the Area under a curve (ii)the volume formed by rotating a function about an axis (objects formed can only be cones or spheres) .(d)The last part of this question may be quite difficult be well prepared .

### **General Comments :**

(a)The marking scheme is as follows (i)Each question is broken into three parts a = 10 marks,b = 20 marks,c = 20 marks .(ii) Attempt marks will be awarded for any step in the right direction (iii)Errors are marked as follows, - 1 for a slip a small arithmetical error ,-3 for a blunder a technical error . (iv) The same mistake is never punished more than once ie you cannot lose marks more that once for a repeated error . (v)The order in which the questions are attempted is not important . For some students the best advice is to do all the part a and b's first then come back and do the more difficult part c's.

**Proofs on this paper (1)Factor theorem(2)Induction(3)The Calculus proofs from first principals**