Indian Institute of Technology

Date ..... Time **3 hours**..Full Marks...**100**..... No. of Students:...**4**.....
End-Autumn Semester **2003-04** Dept **Geology and Geophysics** Subject No **EX40005**...
4th year M. Sc. (Ex.Ge) Subject name **Electrical and EM methods of prospecting**

Instruction: Write short and precise answers of all the questions. Marks are indicated for each question.

Part A

1. Write short answers (10 marks)
   - i) A massive sulfide ore body is exposed on the surface. Which electrical method you will use and why?
   - ii) Draw Triangle of Anisotropy using T, S, and H-lines and mark H, K, A and Q points on that.
   - iii) In K-type situation, the resistivity and thickness of intermediate layer are given as $\rho 2=100\ \Omega m$ and $h2=20$ m. If there is Equivalence for this layer, then what will be the thickness h2 for resistivity $\rho 2= 50\ \Omega m$.
   - iv) Why apparent resistivity vrs AB/2 (half of the current electrode separation) is plotted on log-log scale in resistivity sounding?
   - v) In a three layer earth structure, thicknesses h_1 and h_2 are 20 and 30 m, respectively. Coefficient of anisotropy is given as 1.1, compute the effective thickness of the reduced layer (single layer for top two layers) if **a)** $\rho_1<\rho_2<\rho_3$ and **b)** $\rho_1>\rho_2<\rho_3$.

2. a) Derive the expression for potential over multi-layered Earth. (10 marks)

   b) Find out the solution for kernel function $A_1(\lambda)$ over two layered earth and hence derive the potential over two layered earth. Derive the expression for apparent resistivity expression for Schlumberger array over two-layer earth. (10 marks)

3. Define transverse resistance and longitudinal conductance. Discuss the principle of reduction of two layers into a single layer and derive the expression for effective thickness and effective resistivity of the reduced layer as a general case. (10 marks)

   or

   Discuss the principle of equivalence and suppression. Show mathematically the dependence of sounding curve on resistivity and thickness of intermediate layer. Discuss the problem associated with equivalence and suppression in interpretation. (10 marks)

4. What is induced polarization? Discuss various process of generation of induced polarization. Define chargeability, metal factor and frequency effect. (10 marks)

   or

   What is self-potential? Discuss the Sato & Mooney's theory for SP generation and mention its limitations. Discuss the field procedure and limitations of SP survey. (10 marks)