Reg. No.										

MANIPAL UNIVERSITY

DEPARTMENT OF SCIENCES

THIRD SEMESTER MSc – END SEMESTER EXAMINATION (NOV/DEC - 2017)

SUBJECT: EXPERIMENTAL METHODS IN PHYSICS (PHY-705)

(CREDIT SYSTEM)

TIME: 3 HOURS MAX. MARKS: 50

ANSWER ANY FIVE FULL QUESTIONS

1. (a) Assuming that errors are random with normal distribution, obtain expression for the propagated error in case of estimation of band gap E_g of a semiconductor from electrical resistivity measurement. Given: $\rho = \rho_0 \exp(\frac{-E_g}{2kT})$ where ρ is resistivity, T is temperature, ρ_0 & k are constants.

   (b) Following data set is to be fitted to $f(x) = ax^b$. Obtain the values of parameters a and b from least square method.

x	y
1	2.00
2	2.83
3	3.46
4	4.00
5	4.47

[5 + 5]

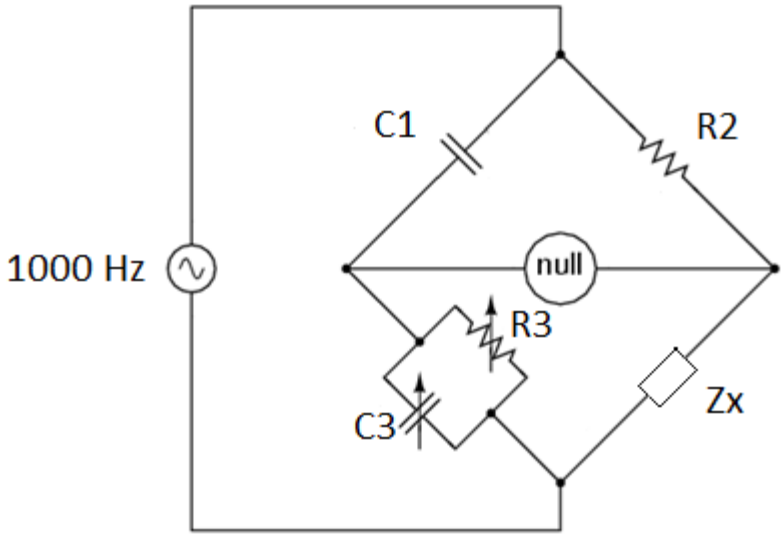
2. (a) Explain working principle of Penning gauge.

   (b) With necessary diagrams, explain the working principle of rotary vane pump. **[5 + 5]**

3. (a) With necessary diagram, derive expression for deflection factor of a cathode ray tube (CRT).

   (b) By assuming that given AC Bridge is balanced, find Zx (Rx and Cx or Lx).

   Given: C1 = 0.2 μF, R2 = 500 Ω, R3 = 300 Ω, C3 = 0.1 μF.



[5 + 5]

4. (a) How thermal conductivity of a material can be estimated from steady state method? Briefly explain.

   (b) Consider a 1-micron-thick strip of gold layer on an insulating substrate that is a candidate for a Hall probe sensor. The current through the film is maintained at constant 100 mA. What is the magnetic field that can be recorded per micro-volt of Hall voltage?

   Given: Gold is monovalent atom with atomic weight 196.97 grams.

   The density of gold is 19.32 g/cm^3

   Avogadro number = 6.023 x 10^{23} **[5 + 5]**

5. (a) Briefly explain atomic force microscopy (AFM) and different modes of operation.

   (b) Explain SEM with the help of block diagram and show the correlation between different geometric shapes and electron intensity. **[5 + 5]**

6. (a) Explain the working principle of vibrating sample magnetometer.

   (b) How various possible interactions between electron and matter are used in material characterization? Briefly explain. **[5 + 5]**

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