Reg. No.										

MANIPAL UNIVERSITY

DEPARTMENT OF SCIENCES

THIRD SEMESTER MSc – END SEMESTER EXAMINATION (NOV/DEC - 2016)

SUBJECT: EXPERIMENTAL METHODS IN PHYSICS (PHY-705)

(CREDIT SYSTEM)

TIME: 3 HOURS MAX. MARKS: 50

ANSWER ANY FIVE FULL QUESTIONS

1. (a) Assuming error is random with normal distribution, estimate the propagated error in case of following functions [a, b & c are constants].

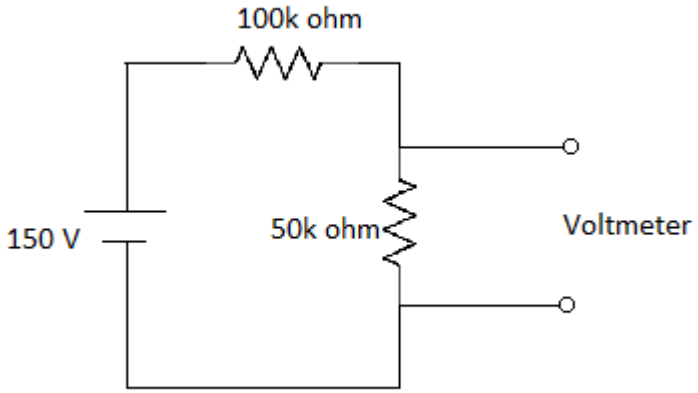
   (i) $u = axy$ (ii) $u = ax^{-1}y$ (iii) $u = cx^a$ (iv) $u = cx^ay^b$

   (b) Give block diagram of digital data acquisition system.

   [8 + 2]

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

   (b) It is desired to measure the voltage across the 50 kΩ resistor in the following circuit. Two voltmeters are available for this measurement: Voltmeter-1 with a sensitivity of 1,000 Ω/V and Voltmeter-2 with a sensitivity of 20,000 Ω/V. Both meters are used in their 50-V range. Calculate (i) the reading in each meter and (ii) percentage of error in each reading.



[5 + 5]

3. (a) The force exerted by a gas on a piston of radius (8 $\pm$0.4) mm is measured to be (30$\pm$2) N. Calculate maximum uncertainty in the calculated value of gas pressure in the cylinder.

(b) Give block diagram of cathode ray oscilloscope and explain the functionalities of different blocks.

[4 + 6]

4. (a) A resistance strain gauge with a gauge factor of 2.4 is mounted on a steel beam whose modulus of elasticity is 2×10^6 kg/cm^2. The strain gauge has an unstrained resistance of 120 Ω which increases to 120.1 Ω when the beam is subjected to stress. Calculate the stress at the point where the strain gauge is mounted.

(b) Briefly explain measurement of electrical resistivity of bulk and thin film samples by four probe method.

[5 + 5]

5. (a) For certain crystal, x-ray diffractogram has shown peaks at 2θ values 40°, 49.52° and 72.64°. Identify the corresponding crystal planes by assuming primitive cubic structure.

(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 elemental analysis can be done with energy dispersive x-ray spectroscopy and secondary ion mass spectroscopy? Explain.

[5 + 5]

****