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MANIPAL UNIVERSITY, MANIPAL

THIRD SEMESTER M.SC (Physics) END SEMESTER EXAMINATION, Nov/Dec , 2015

SUB: Experimental Methods in Physics (PHY – 705)
(CREDIT SYSTEM)

Time: 3 Hrs. **Max. Marks : 50**

Note: a) Answer any FIVE full questions. B) All questions carry equal marks.

1. (a) Giving suitable examples pertaining to physics, distinguish between accuracy and precision.

   (b) A dice is tossed. The outcomes are noted down which are termed random variables. Calculate the expectation value of these random variables.

   (c) Consider a set of data points $\{x_i, y_i\}$ with (i=1,2,3,...n). Using least square method fit a curve $y=ab^x$, where and b are constants.

   (d) Discuss the various processes involved in data acquisition in measurement of physical system parameters.

   [2+3+3+2]

2. (a) Fit a second order polynomial to the following data

X	0	1	2	3	4
Y	6	9	13	21	30

   (b) Classify different vacuum pumps on the basis of their operational principles. Give one example each.

   (c) Explain the principle and working of a rotary pump.

   (d) What is the principle of vacuums gauges functioning on the basis of thermal conductivity? Given one example of such a system

   [3+3+ 2+2]

3. (a) Draw the block diagram of a general purpose CRO. In a CRT explain how one achieves focusing using electro-static lenses.

(b) An oscilloscope is to have an input resistance of 8 MΩ, a sensivity of 50 mV and attenuation factors of 4, 10, 40, 100, 400. Compute the value of the attenuating resistors and their volt/division values corresponding to each attenuation factor. Assume that the internal resistance of the vertical amplifier is too large compared to attenuation resistors.

(c) Using necessary mathematical equations show that a CRO is a linear voltage indicating device. **[3+3+4]**

4. (a) What is a thermistor? Discuss the methodology as regards linear and quadratic approximations.

(b) What is a piezo-electric transducer? Derive the expression for its voltage sensitivity of the crystal.

(c) What are capacitive transducers? Describe two different ways in which such a transducer can be used.

(d) What is an infra-red sensor? Discuss the working of such a sensor. Draw the necessary diagrams. **[3+3+2+2]**

5. (a) Give details of any two methods which are used to measure thermal expansion of solids.

(b) What are the essential differences between two terminal and three terminal methods of measurement of resistivity? Quantitatively explain how the latter is a better method compared to the former.

(c) What is vibrating sample magnetometer (VSM)? Draw a schematic presentation of such a VSM set-up. Using necessary mathematic equations show how one can measure magnetic moments of solids. **[2+ 4+ 4]**

6. (a) Deliberate how electron microscopy is a better method than optical microscopy. Discuss the principle and working of SEM. Draw the necessary diagrams.

(b) Deliberate why X-ray diffraction method is suitable to study crystal structure. What are reciprocal lattices? Discuss the principle and working of any one XRD set-up used to study crystal structure. Discuss why one uses reciprocal lattice instead of direct lattice.

(c) Describe the working of an EDAX set-up. Draw the necessary diagrams. **[3+4+3]**