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**BITS, PILANI – DUBAI, INTERNATIONAL ACADEMIC CITY, DUBAI**  
**SECOND SEMESTER 2008 – 2009**  
**TA C222 MEASUREMENT TECHNIQUES – II**  
**TEST2 EEE (CLOSED BOOK)**

**MAXIMUM MARKS: 20**  
**DATE: 10.05.09**

**WEIGHTAGE: 10%**  
**DURATION: 50 MINUTES**

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1. A large building mass behaves like a first order system when responding to a harmonic thermal input. If the harmonic input follows the pattern of daily heating and cooling (ie) one cycle occurs over a 24 hour period and the time delay is 3 hours, estimate the time constant. Also find how much the amplitude response decreases at this frequency.

**[5 Marks]**

2. The measurement of power is to be conducted by measuring current through the source as given by the equation  $P = I^2 \left( \frac{R_1 R_2}{R_1 + R_2} \right)$  where  $R_1$  and  $R_2$  are parallel resistances.

Calculate the nominal value of power delivered by the source and its percentage of uncertainty for the following conditions.

$$I = 10A \pm 2\%$$

$$R_1 = 500 \Omega \pm 5\%$$

$$R_2 = 1000 \Omega \pm 5\%$$

**[5 Marks]**

3A. Define Least count and Readability.

**[2 Marks]**

3B. Explain the working principle of attraction type moving Iron meter.

**[3 Marks]**

4. Explain the LVDT with respect to the following.

4A) Draw a neat schematic diagram.

4B) What are its input and output?

4C) Draw the V-graph.

4D) What is meant by null voltage?

**[2+1+1+1 Marks]**

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**BITS, PILANI – DUBAI**  
**II Semester 2008 – 2009**

**Test I (Closed Book)**

**Course No & Title : TA C222 Measurement Techniques II (Non EEE)**

Date: 02/04/09  
Time 50 minutes

Max: 40 marks  
Weightage: 10%

- Answer All Questions
- Assume suitable data, if required

- 1 a Briefly explain the working principle of an inclined manometer. [3]
- b U tube manometer containing mercury was used to find the negative pressure in the pipe containing water. The right limb was open to the atmosphere. Find the vacuum pressure in the pipe if the difference of mercury level in two limbs was 100mm and height of water in the left limb from the centre of the pipe was found to be 40mm below. Take specific gravity of mercury as 13.6. [7]
2. The resistance of a resistance thermometer wire is given by  
$$R = R_0 [1 + \alpha (T - T_0)]$$
Where  $R_0 = 10 \Omega \pm 0.5\%$  is the resistance at reference temperature.  $\alpha = 0.005 /K \pm 1\%$  is the temperature coefficient of resistance, and the reference temperature at which the  $R_0$  was determined is  $300 K \pm 2K (T_0)$   
Calculate the following:  
(a) The nominal resistance at 350 K  
(b) The sensitivity of the resistance thermometer  
(c) The uncertainty involved while measuring the resistance of the thermometer. [10]
- 3 a A venturimeter with throat diameter of 15 cm is connected to a vertical pipe of diameter 30 cm. The vertical pipe carrying oil with specific gravity of 0.9 flows upwards. The difference in elevation of throat section and entrance section of venturimeter is 30 cm. The difference of mercury level in differential U-tube mercury manometer is 25 cm. Calculate (i) discharge of oil and (ii) pressure difference between entrance and throat section in  $N/m^2$ . Take specific gravity of mercury as 13.6 and coefficient of venturimeter as 0.98. [8]
- b Define the term: stagnation pressure [2]
- 4 a Define Newton's law of viscosity [2]
- b The velocity distribution of a viscous fluid with dynamic viscosity = 0.85  $Ns/m^2$  flowing over a fixed plate is given by  $u = 0.75 y - y^2$ .  $u =$  velocity in m/s and  $y =$  distance from plate in m. What are the shear stresses at the plate surface and at  $y = 0.25m$ . [8]