	TANTA UNIVERSITY FACULTY OF ENGINEERING DEPARTMENT OF MECHANICAL POWER ENGINEERING			
	EXAMINATION FOR FRESHMEN (2015 YEAR), STUDENTS OF 2th GRADE MECHANICAL POWER			
	COURSE TITLE:	Measuring instruments		COURSE CODE: MEP2205
DATE:	May 17, 2015	TERM: 2nd	TOTAL ASSESSMENT MARKS:	TIME ALLOWED (HOURS): 3

(Answer the following 5 questions, With Simple Drawing)

Q1

a) Define the following terms (Static Error – Modifying Inputs)

b) For Wheatstone bridge the value of R_4 can be calculated from the relation $R_4 = R_2 R_3 / R_1$ where;

$R_1 = 120 \pm 0.6\%\ \Omega$, $R_2 = 1200 \pm 0.6\%\ \Omega$, $R_3 = 900 \pm 0.6\%\ \Omega$,

Q2

a) Define the following terms (Reproducibility – Dead Zone)

b) The following data are expected to follow a linear relationship of the form $y = ax + b$. obtain the best liner relation in accordance with a least square analysis.

x	0.0	1.0	2.5	4.0	5.5	7.0	8.5	10
y	0.4	0.9	1.6	2.5	3.2	4.2	5.1	6.1

Q3

a) Make a comparison between GlassThermometers and Electrical Resistance Thermometers.

b) A bimetallic strip of *10cm*length and *1.5 mm*thickness for each metal. The element is initially straight at 25^oC. One of the metals with an expansion co-efficient of 12.5×10^{-6} / ^oC , and the other with 2.5×10^{-6} / ^oC. Calculate the maximum and minimum movement of the free end, if the measuring of the temperature ranges from 50 ^oC to 200 ^oC.

Q4

a) With simple drawing, express the equation of the pressure difference of a Well Type Manometer.

b) A U – tube manometer uses mercury as the manometer fluid. What is the height to which the mercury will rise in the narrow limb if a differential pressure of *100 kN/m²* is applied?. The wide and the narrow limb diameters are *150mm* and *5mm* respectively. The density of mercury is *13.6 g/cm³*.

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Q5

a) With simple drawing, express the equation of the velocity using the Pitot – Static Tube as a measuring device.

b) APitot tube is used to measure the velocity of water at the axial line of a pipe. Calculate the water velocity if the static pressure head is *4.72m*, the stagnation pressure head is *5.67m*, and the velocity correction factor is 0.97.

EXAMINERS	Dr. Esam Elkinany	

Bestwishes

TANTA UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF MECHANICAL POWER ENGINEERING
SECOND YEAR STUDENTS OF PRODUCTION ENGINEERING & MACHINE DESIGN

COURSE TITLE: HEAT TRANSFER COURSE CODE: MEP2251

DATE: MAY, 17, 2015 SECOND TERM TOTAL ASSESSMENT MARKS: 100 TIME ALLOWED : 3 HOURS

Remarks: (answer the following questions; assume any missing data, steam and heat tables and charts are allowed)

Problem number (1) (20 Marks)

a) Derive the expression for the thermal resistance through a hollow spherical shell inside radius r_i, and outside radius r_o having a thermal conductivity k. **(6 Marks)**

b) Water flow inside a steel pipe (k=43 W/m. °C) of 2.5 cm outer diameter. The wall thickness is 0.2mm the convective heat transfer coefficient on the inner side is 500 W/m^2. °C while on the outer side 0.12 W/m^2. °C. Calculate the overall heat transfer coefficient. If the pipe is covered with an asbestos layer (k=0.18 W/m.°C) while still surrounding by a convective environment with (h = 12 W/m^2. °C) . Determine the critical insulation radius. **(14 Marks)**

Problem number (2) (20 Marks)

a) Explain how the thermal contact resistance can be minimized? **(4 Marks)**

b) What does the thermal resistance of a medium represent? **(4 Marks)**

c) A long and thin copper rod of 6.4 mm diameter (k = 372 W/m.°C) is exposed to an environment at 20 °C. The base temperature of the rod is 150 °C. The heat transfer coefficient between the rod and environment is h = 15 W/m^2.°C. Determine:

(1) The heat given up by the rod.

(2) Fin effectiveness.

(3) Fin efficiency. **(12 Marks)**

Problem number (3) (20 Marks)

a) For which solid is the lumped system analysis more likely to be applicable: an actual apple or a golden apple of the same size? Why? **(5 Marks)**

b) A long 20 cm diameter cylindrical shaft made of stainless steel 304 comes out of an oven at a uniform temperature of 600 °C. The shaft is then allowed to cool slowly in an environment chamber at 200 °C with an average heat transfer coefficient of h = 80 W/m^2. °C. Determine the temperature at the center of the shaft 45 min after the start of the cooling process. Also,

determine the heat transfer per unit length of the shaft during this time period. The properties of stainless steel304 at room temperature are k = 14.9 W/m. °C, ρ = 7900 kg/m^3, and C_p = 477 J/kg. °C and $\alpha = 3.95 \times 10^{-6}$ m^2/s. **(15 Marks)**

Problem number (4) (20 Marks)

a) How does radiosity for a surface differ from the emitted energy? For what kind of surfaces are these two quantities identical? **(4 Marks)**

b) Define the angle factor, black body, and irradiation. **(4 Marks)**

c) Two concentric spheres of diameters D_1= 0.3 m and D_2 = 0.8 m are maintained at uniform temperatures T_1 = 700 K and T_2 = 400 K and have emissivities ε_1=0.5 and ε_2=0.7, respectively. Determine the net rate of radiation heat transfer between the two spheres. **(12 Marks)**

Problem number (5) (20 Marks)

a) Explain how the LMTD method can be used to determine the heat transfer area of a multipass shell-and-tube heat exchanger when all the necessary information, including the outlet temperatures, is given? **(7 Marks)**

b) What are the heat exchanger effectiveness, Reynolds number, and Grashof number? **(6 Marks)**

c) How does a cross-flow heat exchanger differ from a counter –flow one? What is the difference between mixed and unmixed fluids in cross flow? **(7 Marks)**

With my best wishes

EXAMINERS DR. ELSAYED ELSAID