INDIAN INSTITUTE OF TECHNOLOGY, KHARAGPUR

Date: 20.02.2015 AN, Time: **2 Hrs**, Full Marks **30**, Deptt **Agric & Food Engg**
No. of Students **44**, Mid Spring Sem. Exam. 2014-15
Sub. No. **AG60148** Sub. Name **Instrumentation and Control in Food Industries**

(Answer the following; Any combination you can choose to answer exactly 30 marks)

Q.1 Color of an object is perceived by human eye and its reproduction proceeds with visual-brain coordination. Discuss the similarity between this sense by human visual system and measurement of color using colorimeter.

What is difference between simple colorimeters and reflective spectrophotometer in measurement of food color? Why standard illumination is necessary in measurement of color of foods? Write two popular color scales used for expression of color of an object.

[4 + 2 + 2 +1 + 1 = 10]

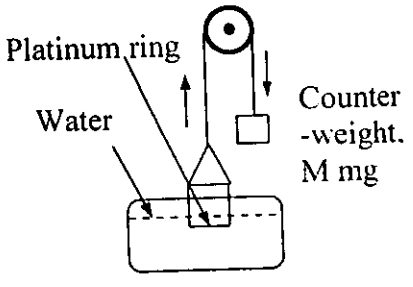
Q.2 Explain your understanding on chromatography and chromatogram? Name at least three different types of chromatography used for analysis. Discuss the difference between GC, GLC and HPLC. Name the detector to be used for determination of Chlorinated pesticide residue in foods. How the concentration of a component in a sample could be ascertained with the chromatogram?

[1 + 1 + 1 + 1 +1 = 5]

Q.3 What do you understand by the term spectrophotometry? What are different types of spectroscopy used in different fields of analysis? Discuss the laws associated with absorption spectrophotometer. Explain with a diagrams what do you understand by resonance wave length emitted from hollow cathode lamp.

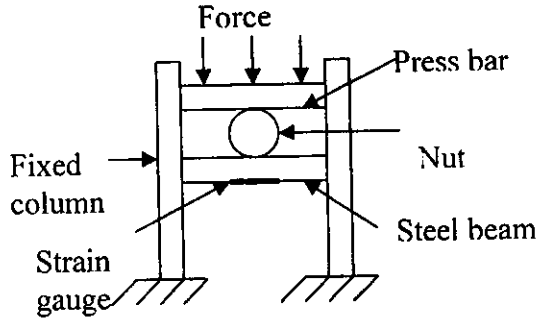
[1 + 1 +2 + 3 = 7]

Q.4 A platinum ring made with 0.1 mm wire has inner diameter of 19.3 mm. It was used for measurement of surface tension of water at 35°C. The ring was attached to a system that pulls the ring vertically upward using a frictionless pulley as shown in figure. The ring detached from the liquid surface when the mass of 'M' mg was placed as counter-weight on the pan. If the surface tension of water is 72 milli-Newton per meter, calculate the value of M [Hint: 1 N = 1 kg m s^{-2}] [7]



Q 5 In a ring balance manometer, the applied pressure differential caused an angular deflection of 9°8′. Calculate the pressure differential in mm of mercury (density 13600 kg m^{-3}). The ring diameter of the manometer tube is 0.6 cm, ring radius is 35 cm and a dead weight of 60 g is attached to the manometer at a distance 35 cm from the pivot. **[5]**

Q.6 A set-up has been used to measure the fracture force of a nut under compression (Figure below). A nichrome wire strain gauge (λ = 2.0) is attached to the steel beam. The deflection caused to the steel beam vis-a-vis to the strain gauge by the applied force. The strain gauge has been calibrated at 25°C (Force versus Strain). Calculate the error that would be with this strain gauge for 0.5 mm strain per degree change in temperature.
Given $\beta_g = 9.9 \times 10^{-5}$/°C; αsteel = 1.18×10^{-5}/°C; $\alpha_{Nichrome} = 1.27 \times 10^{-5}$/°C.



[8]