THE OPEN UNIVERSITY OF SRI LANKA

CERTIFICATE IN INDUSTRIAL STUDIES

FINAL EXAMINATON – 2007/ 2008

TTZ1235- MATHEMATICS & SCIENCE FOR TEXTILE & APPAREL

DURATION - THREE HOURS

Date: 13th May 2008	TIME: 0930 – 1230 Hrs

Answer 06 Questions including question 01, which is <u>compulsory.</u>

Question 1 carries twenty-five (25) marks and Questions 2 to 9 carry fifteen (15) marks each.

You should clearly show the steps involved in solving problems.
No marks are awarded for the mere answers without writing the necessary steps

01 Compulsory Question

(1) (a) A vernier scale is designed in such a way that 99 mm in main scale is divided into 100 equal divisions in the vernier scale. What is the least count of the vernier scale?

(b) In a screw gauge, the pitch is 0.5mm and there are 100 divisions in the head scale. Determine the least count of the screw gauge.

(c) A block of a metal has 5 cm length, 5 cm width, 2 cm height and mass of 300g. Calculate the density of the metal.

(d) Calculate the mass of 750m length of a yarn, which has the count of 18 tex. (Tex count is the mass of 1000 meters of yarn in gram)

(e) A fibre has a circular cross-section with a diameter being 14µm. What is the area of cross-section of the fibre?

(f) Mass of a fabric sample of size 15cm x 15cm is 9 gram. Determine the surface density of the fabric.

(g) Mass of a specimen of cotton fibre in the atmosphere is 58.25g.Its oven dry weight is 54.25g.
Calculate the 'percentage moisture content' and 'percentage moisture regain' of the cotton specimen.

(h) Define the 'electric current.

(i) Write following numbers in standard form.
    (i) 0.00467   (ii) 12,500

(j) The mass number of Uranium atom is 235 and the atomic number is 92.Determine the number of electrons, protons and neutrons in the Uranium atom.

(25 marks)

(2) (a) Describe the following terms.

    (i) Absolute humidity   (ii) Relative humidity   **(06 marks)**

    (b) Explain the importance of moisture and humidity in Textile Industry. Illustrate your answer with giving suitable examples.

(09 marks)

(3) (a) " In the case of fibres and yarns, the thickness is expressed as 'linear density'". Explain this statement.

(07 marks)

    (b) Define two units of 'linear density', which are used for textile yarns.

(04 marks)

    (c) Calculate the surface area of a fibre of length 1cm, which has the diameter of $20\mu m$.

(04 marks)

(4) (a) Use the theory of indices to simplifying the following expressions.

    (i) $(0.125)^{1/3}$ (ii) $(243/3125)^{1/5}$

    (iii) $(216/125)^{-2/3}$ (iv) $(512/27)^{-4/3}$ **(04 marks)**

(b) Simplify the following

$$\left(\frac{64}{125}\right)^{-1/3} \quad \text{x} \quad \left(\frac{8}{343}\right)^{2/3} \quad \text{x } 7^0$$
                                                     (05 marks)

(c) Determine the value of 'x' in following equation

$$3^x \times 27^x = 243$$
                                                 (06 marks)

(5) (a) Solve the following equations

    (i) $x + 2y = 46$ (ii) $\dfrac{3x-1}{7} - \dfrac{2x+1}{3} = 5 - \dfrac{5x}{6}$

         $4x - y = 13$

                                                       (10 marks)

(b) The distance from Colombo to Galle is 116km. A cyclist starts from Colombo towards Galle at a steady speed of 16 km h^{-1}. An hour later, a motorist starts from Galle for Colombo and travels at an average speed of 48 km h^{-1}. How far from Colombo do they meet?

                                                       (05 marks)

(6) (a) State the Newton's laws of motion. **(03 marks)**

(b) Starting from 2nd law of motion, derive the equation **F=ma,** Where

F-force, m- mass and a - acceleration

Using the equation **F=ma** define the unit **Newton**.

(06 marks)

(c) A man of mass 75kg is supported by a rope attached to a helium filled

balloon. If the balloon rises with acceleration $4ms^{-2}$, calculate the tension

of the rope. **(06 marks)**

(7) (a) Write four (04)equations of motion for an object traveling in a straight line

with uniform acceleration. **(04 marks)**

(b) A car traveling at the speed of 36km/h is brought to rest with constant
retardation in 5 s by application of brakes. Find the retardation produced
by brakes and the distance traveled by the car after brake applies.

(05 marks)

(c) A toy car starts from the rest and it is accelerated uniformity at the rate of
$4ms^{-2}$ for 10 s. It then moves with the constant speed for 60(s). After 60 s,
brakes were applied and vehicle stopped in 5 (s) with uniform retardation.
Determine the maximum speed and the total distance traveled.

(06 marks)

(8) (a

da

(b)

F
(

(9)

(8) (a) What are the advantages of plotting a graph, when presenting numerical data? **(03marks)**

(b) Degree of twist in a yarn can be indicated by twist factor, which is given by following formula.

Twist factor = (turns/cm) x $\sqrt{\text{linear density(Tex)}}$

Plot a graph of **twist factor** against **turns/cm** for 25 Tex yarn.
(Take the range for **turns/cm** as 4 – 10)

(10marks)

(c) Using the plotted graph in part (b), determine the twist factor of the yarn having the twist of 7.5 turns/cm. **(02marks)**
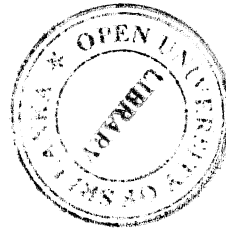
(9) (a) Describe three factors which influence the solubility **(03 marks)**

(b) Define "Molar concentration" of a solution

(02 marks)

(c) Calculate the molecular weight of H_2SO_4. (H=1, S=32, O=16)

(04 marks)

(d) Describe how do you determine the concentration of Hydrochloric acid solution with using a sodium hydroxide solution which has known concentration?

(06 marks)