Uva Wellassa University, Sri Lanka
Faculty of Science and Technology
Science and Technology Degree Programme
1st Semester Examination – March/April 2013

Uva Wellassa University

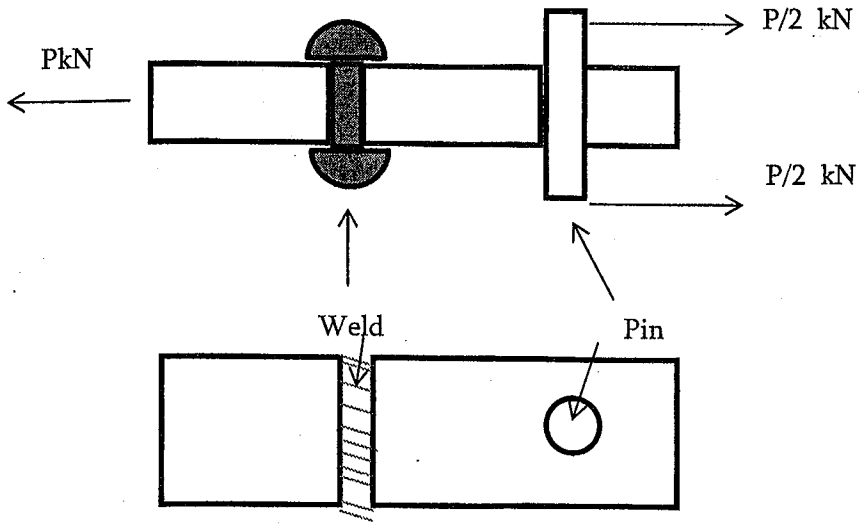
SCT 464 – 2 Food Equipment Design and Fabrication

Instructions to candidates
Total number of questions: Seven (07)
Answer Four (04) questions only
Time allocation: Two (02) hours
Total marks allocated: 100

1. Describe ferrous and non-ferrous metals.
   a. Define five mechanical properties of metals.
   b. Explain why alloys are more suitable for machine design than pure metals.
   c. Give 3 examples as to how impurities in metals help to improve certain properties.
   d. What is stainless steel? How do you apply the same in food machinery design?

(25 marks)

2.
   a. What are the stresses that a machine component can undergo? Explain with examples.
   b. Describe stress, strain and Young's modulus.
   c. What is the function of steel in concrete?
   d. A machine component is subjected to a tensile load of P kN as below.



The thickness of the plate is 10 mm, width is 30 mm and the diameter of the pin is 8 mm

P = 10 kN

Maximum tensile strength of weld material is 65 N /mm^2

Maximum shear strength of pin material is 50 N/mm^2

$F_t = P/A$ $F_s = P/A$

P =load applied and A = Area under load.

From what point (weld or Pin) will the system fail if the load is gradually increased up to 10 kN.

(25 marks)

3.

a. Explain methods of power transmission and draw sketches. Give examples for each system.
b. What are the losses that may encounter in such transmissions and how do we overcome them.
c. Draw a cross section of a "V" belt and name it.
d. A machine is to be driven at 5000 rpm using a 1450 rpm induction motor. Select the dimensions of pulleys for the system.
e. If the centers of pulleys are 750 mm away, calculate the length of the Flat belt required.

Belt Length $L = \pi/2\ (d1 + d2) + 2X + (d1 - d2)2 / 4X$

(25 marks)

4.

a. What are the main types of Fans used in the industry? Explain using sketches.
b. What is forward and backward curved blade Fans. Draw sketches.
c. Explain Fan Laws.
d. A radial Fan running at 1500 rpm delivers 12,000 CFM at 200 mm water gauge pressure. Find the following.
   i. New volume of air if the speed of the Fan is reduced by 50%
   ii. Percentage of reduction of power consumption in above (i)
e. If the Fan efficiency is 80%, calculate the power absorbed in above (d)

Power (Hp) = CFM x Pressure (WG inch) / (6350 x efficiency.) (25 marks)

5. If you are assigned to design a food processing facility explain your criteria in steps from the site selection up to the delivery of the food stuff to the cold storage.

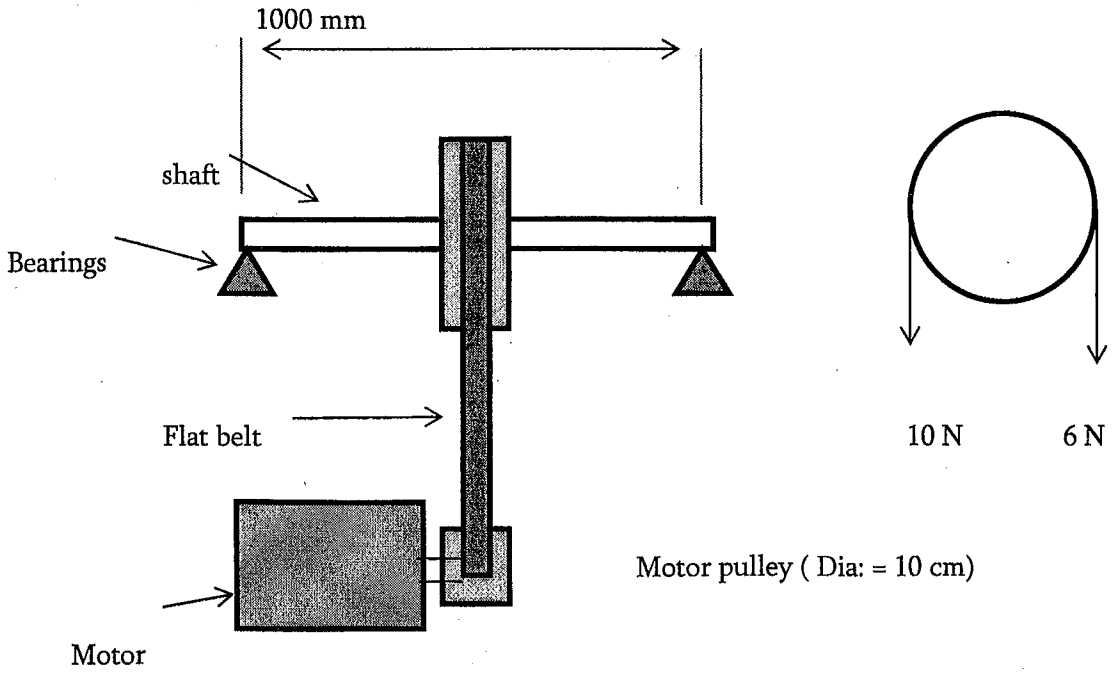
(25 marks)

6.

a. Explain your approach towards successful machine design for the food industry.
b. Explain three modes of renewable energy sources and their potentials in Sri Lanka.
c. What are the types of boilers being used in the industry? What are their applications?
d. Describe 5 important components in a boiler. Describe the functions of each.
e. What do you mean by Food grade lubricants?

(25 marks)

7. Given below is a power transmission system in a factory.



a. If the shear stress of the shaft (f_s) = 32 N / mm^2 find the shaft diameter.

{ T/ J = f_s/ r) , r= radius of shaft, J = $\pi d^4/32$ }

b. If the shaft is to be rotated at 200 rpm, find the power transmitted.

{ P = 2 πN T/60 } watts

c. If the weight of the shaft pulley is 10 kg and specific weight of the shaft is 1 kg/cm, find the bending stresses developed in the shaft.

{M / I = f_b/r, M = bending moment, I = $\pi d^4/64$, r =d/2 }

(25 marks)