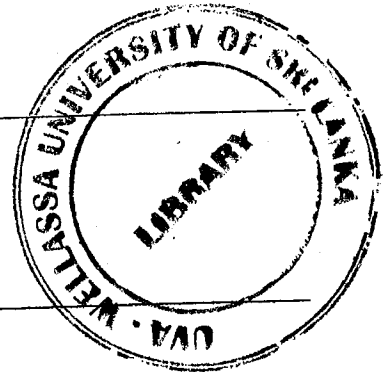


Uva Wellassa University, Sri Lanka

End Semester Examination – Sep/Oct 2012

SCT 464-2 Food Equipment Design and Fabrication

Time: Two (02) hours



Total number of questions six (06)

Answer only Four (04) Questions

All questions carry equal marks

1) a) Sketch the following welds

i). V butt

ii). Double V butt

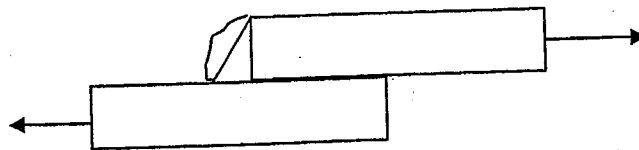
iii). Square butt

(01 mark)

b) A 10 mm thick, 85 mm wide, steel plate has been welded to a steel plate of similar thickness by means of single transverse weld as shown in the following figure. The load applied on the plate is 60 kN. Calculate the tensile stress developed in the weld.

( $f_t = P/A$ , A= throat area)

(04 marks)



c) An engineer has recommended the following welding rod for a specified job.

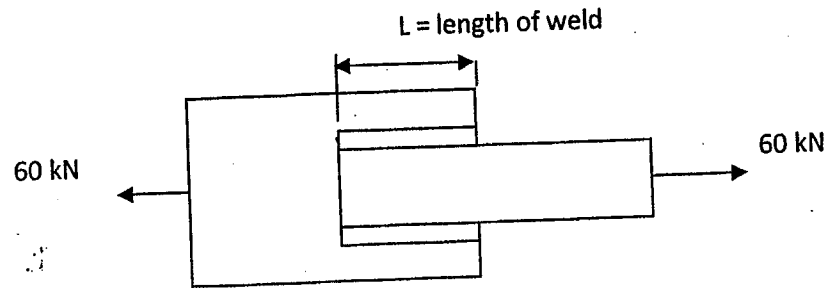
E 70 1 8 - B<sub>1</sub>

i) What is the minimum tensile strength of the welding rod material?

ii) What is denoted by "1" in the above notation?

(01 mark)

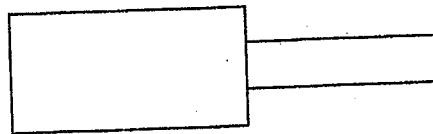
d) If the above weld in the section (b) is to be designed against shear failure, calculate the lengths of the weld. (You are given that  $f_s = 52 \text{ N/mm}^2$ )



(04 marks)

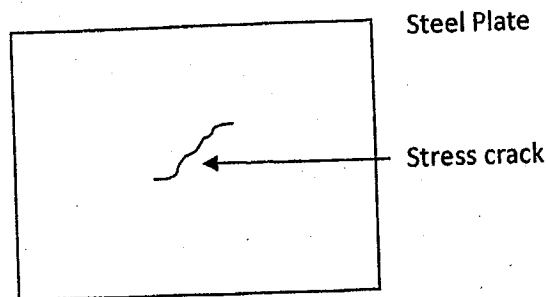
2) a) Explain various kinds of stresses that could develop in a machine component (03 marks)

b) How do you minimize the stress developed in the following component? (02 marks)



(02 marks)

c) Suggest a method to prevent the propagation of the stress crack developed in a steel plate as shown below. Draw your suggestion.



(02 marks)

- d) i) What is stainless steel?  
ii) What is the notation of the Stainless steel sheet you recommend for a food processing machine?  
iii) What is the composition of Gun metal?  
iv) Write an application of Gun Metal in the food industry  
v) Give examples for 3 non ferrous metals  
vi) What is ductility? (03 marks)

3) If you are assigned to design a Ball Tea machine to process 1500 kg of Green Tea per batch, lay down your design criteria. Clearly indicate your assumptions and the data that you expect to be obtained from text books and tables. (10 marks)

4)

4.1 A shaft rotating at 220 rpm transmits (P) 100 kW. Calculate the following.

a) The torque (T) developed in the shaft. ( $P = T \cdot \omega$ ,  $\omega$  = angular velocity) (04 marks)

b) If the allowable shear stress for the above shaft material is  $65 \text{ kN/mm}^2$ , design the shaft diameter.

( $T / J = \tau / r$ ,  $J = \text{polar moment of inertia} = \frac{\pi d^4}{32}$ ,  $r = d/2$ ) (04 marks)

4.2

a) What are the important parameters that you should know when designing a pipe for transporting a liquid? (02 marks)

5) Suppose that you are working in a food processing factory and your superior wants you to study the performance of a machine and suggest possible modifications to improve the productivity and the efficiency of the same. Write down your approach to achieve the target in point form.

(10 marks)

6) a) Why Ergonomics is important in machine designs?

(02 marks)

b) Compare "Flat belts" Vs "V" belts.

(02 marks)

c) What is the function of a spring in a machine?

(02 marks)

d) A 10 cm diameter ( $D_1$ ) "V" pulley rotates at 100 rpm ( $N_1$ ) and drives another "V" pulley having a diameter ( $D_2$ ) of 20 cm. Calculate the speed of the larger pulley ( $N_2$ ) and the belt speed. ( $N_1 * D_1 = N_2 * D_2$ )

(04 marks)

.....End of Paper.....