The Open University of Sri Lanka
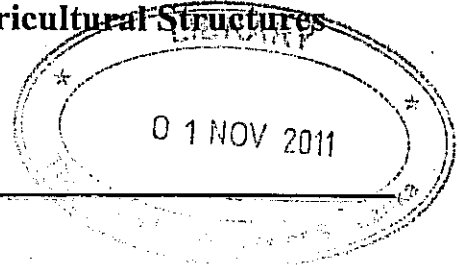Faculty of Engineering Technology

Technology (Engineering) Programme of Study
Final Examination – 2010/2010
AEX 6230 Environmental Control in Agricultural Structures

Date   :29/03/2011
Time   :1400-1700
Duration: Three (03) hours

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SECTION 2: Answer any four questions.

1. An apple storage is to be built to hold 1200 tons, equally divided into four rooms. The interior temperature has to be maintained at 32°F while the outside temperature is 70°F. The storage will be filled over a period of four days, the daily input being 300 tons divided equally between the four rooms, and each day's input must be cooled down to storage temperature within 24 hours. Calculate the refrigeration load in BTU/day during the 24 hours immediately after the last input has been made, and the maintenance refrigeration load thereafter in BTU/day. Assume that the empty storage has been cooled down to 32°F before filling begins, and that heat gain through the floor is negligible. The following data may be used in your calculations:
    Walls and ceiling are insulated to an R of 25. The specific heat of fresh apples is 2500 BTU/ton/°F, the heat of respiration is 700 BTU/ton/day and 3500 BTU/ton/day at 32°F and 65°F respectively, and the recommended storage volume for apples is 105 ft^3/ton including space for air circulation etc.

2. A storage is being designed in which dry potatoes will be piled 8 ft. deep against walls that are 14 ft. high, the bin width being 12 ft. If studs are to be placed 16" apart on centre, the bending moment on the bin wall per foot of length is 528 lb-ft., and the safe fibre stress for the stud material is 1200 psi, determine a suitable stud size.

3. Write short notes on three of the following:

    a)   The principle of operation of a greenhouse

    b)   Farm location

    c)   Manure management

    d)   Radiant heat transfer

4. Describe the principle of evaporative cooling and how this may be employed in practice to cool animal housing.

5. Describe how you would design a low cost cattle housing unit for a small dairy farm of ten cows in Bandarawela, using local materials wherever possible. (A proper engineering design with drawings to scale is not required).

6. Describe any popular mechanised poultry feeder system in detail.