TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN FOOD TECHNOLOGY & QUALITY ASSURANCE

BSFQ13S AND BSFQ14S2

AFS 4312: FOOD ENGINEERING III PAPER II : Type unit name.

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: Pick Date Select Month Pick Year

Instructions to Candidates
You should have the following for this examination
   -*Answer Booklet, examination pass and student ID*
This paper consists of Choose No questions. Attempt Choose instruction.
Do not write on the question paper.

Question ONE

(a) Name FIVE applications of Centrifugation in the food industries **(5 Marks)**

(b) Name the THREE types of filter medium citing examples in each case **(5 Marks)**

(c) Write short notes on antiscalants (scale inhibitors) as used in Reverse Osmosis **(5 Marks)**

(d) Given below is the Van't Hoff equation which is used to predict osmotic pressure of solutions, Name the symbols used in the equation (6 Marks)

$$\Pi = \frac{RT}{V} ln(a_w) = MRT$$

(e) Explain the principle of reverse osmosis relating it to diffusion and osmosis (9 Marks)

Question TWO

(a) The Darcy equation showing the basic operating principle of Ultrafiltration is given by the formula $J = \frac{TMP}{\mu R_t}$. State the meaning of the symbols used in the equation **(4 Marks)**

(b) It is desired to increase the protein concentration in whey, from cheese manufacture, by a factor of 12 by the use of ultrafiltration to give an enriched fraction which can subsequently be dried and used to produce a 50% protein whey powder. The whey initially contains 6% of total solids, 12% of these being protein. Pilot scale measurements on this whey show that a permeate flow of 30 kg m^{-2} h^{-1} can be expected, so that if the plant requirement is to handle 30,000 kg in 6 hours, estimate the area of membrane needed. Assume that the membrane rejection of the protein is over 99%, and calculate the membrane rejection of the non-protein constituents.
(11 Marks)

Question THREE

With an aid of a clear labelled diagram(s) discuss the mode of operation including advantages and disadvantages of Nozzle Discharge   Centrifuge **(20 Marks)**

Question FOUR

With an aid of a clear labelled Diagram(s) discuss the mode of operation of a Vertical Pressure Leaf Filter including advantages and disadvantages **(20 Marks)**

Question FIVE

A process of extracting sugar from sugar cane involves pressing the cane through a 3-roller miller followed by shredding of the fibre residue (bagasse) and extracting the sugar with the water. The cane originally contain 20% fibre, 16% sugar and 64% water. After milling the moisture content of bagasse was found to be 55%. Since the fibre is used for fuel after the extraction battery stage the solids are squeezed to remove the absorbed solution and the squeezed solution is added to the last stage, the following are the conditions:

a) Sugar recovery must be minimum 99%.
b) The concentration of sugar in the final product must be 10%.
c) The bagasse carries a constant amount of the solution of 1.22kg solution / kg fibre.

Calculate:

a)   The water-solid ratio needed
b)   Components lost during milling
c)   The final sugar content of the extract mixed with the juice first pressed from the cane and

(20 Marks)