

# KERALA AGRICULTURAL UNIVERSITY

B.Tech. (Food Engg. ) 2015 Admission

IV Semester Final Examination – August - 2017

Seat No: Fden. 2207

Marks: 50

Title: Unit Operations in Food Engineering (2+1)

Time : 2 hours

I. Fill in the blanks:

(10 x 1=10)

1. The difference between the adsorption and desorption EMC at any given temperature and relative humidity is termed as -----
2. If moisture content of a product is 50% on wet basis, its moisture content in dry basis is -----
3. ----- is the removal of relatively small content of liquid from compressible milled foods by mechanical means.
4. Spiral separator separates the grain as per their -----
5. Unit of specific cake resistance is -----
6. ----- law is used to calculate Work Index.
7. The concept of homogenization efficiency was given by -----
8. In ----- feed multiple evaporator, liquid enters first at the highest temperature and pressure evaporator.
9. According to FAO/IAEA/WHO Joint Expert Committee, food items irradiated upto an average dose of ----- can be accepted as safe from the health angle.
10. Microwave radiation at a frequency of ----- is allocated for domestic microwave heating applications.

II. Write short notes on ANY FIVE:

(5 x 2=10)

1. Stoke's law.
2. Kick's law.
3. Water activity.
4. Mixing Index.
5. Dimensional analysis.
6. Cleaning efficiency.
7. Economy of an evaporator.

III Write answers on ANY FIVE:

(5 x 4=20)

1. Batch crystallizer.
2. Cyclone separator.
3. Hammer mill.
4. Supercritical fluid extraction.
5. Thermal Vapour Recompression.
6. Emulsification.
7. Microwave cooking.

IV. Write essay on any ONE

(1 x 10)

1. Tomato juice at 5.5 kg/s feed flow rate and 60°C inlet temperature is concentrated in a double-effect forward feed evaporator using steam in the first effect at a pressure of 97.2 kPa (gauge) and cooling water in the condenser (surface condenser) entering at 30°C and leaving at 45°C. The heat transfer area, the overall heat transfer coefficient, the boiling point elevation (BPE), and the pressure in each effect are shown in the following table. The solids content and the heat capacity of the feed are 11% and 3900 J/kg °C respectively. Calculate the steam flow rate, the solids content at the exit of each effect, the steam economy, and the flow rate of cooling water in the condenser.

	First Effect	Second Effect
Heat transfer area, m <sup>2</sup>	100	100
Overall heat transfer coefficient, W/m <sup>2</sup> °C	2000	1000
Boiling point elevation, °C	0.4	0.8
Saturation pressure, kPa	90	17.9
Heat losses, kW	5	4
Heat capacity at the exit, J/kg°C	3800	3450

2. Explain the importance and application of different types of membranes in food industry.

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