



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH/FT(O)/SEM-5/FT-503/2012-13

2012

FOOD PROCESS ENGINEERING

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A
(True / False Type Questions)

1. Answer the following by indicating whether the statements
are True (T) or False (F) : 10 × 1 = 10

i) Heat damage is maximum in thin film evaporator.

True / False

ii) An abrasive material made from silicon and carbon is
known as carborundum.

True / False

iii) Tin cans are made of thin steel plate of high carbon
content and lightly coated on either side with tin metal
to thickness of about 0.0025 cm.

True / False

iv) Steam should be brought into the retort from the
bottom.

True / False

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[Turn over



- v) Shear stress is primary extrusion variable and screw speed is secondary extrusion variable. *True / False*
- vi) The length, thickness, cover hook, body hook of a A-2 $\frac{1}{2}$ can is 2.97 to 3.17, 1.4 – 1.45, 1.9, 2.16 respectively. *True / False*
- vii) Liquid physically or chemically bound to a solid food matrix which at the same temperature is known as free moisture. *True / False*
- viii) The clearance between rollers of double drum drier is of the range of (0.1 – 0.12) inch which is considered optimum. *True / False*
- ix) Normally the height of cold storage is 1.5 m and 23 – 30% space is provided for movements. *True / False*
- x) The velocity of the air needed to achieve fluidization of spherical particles is equal to $\sqrt{\frac{4d(\rho_s - \rho)}{3c_d\rho}}$, where d is the diameter of the particle in metre, ρ_s is density of solid particles to be dried in kg/m^3 , ρ is the density of air in kg/m^3 and c_d is drag coefficient. *True / False*

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Differentiate between the following :
- Cold storage and frozen storage
 - Refrigeration and freezing
 - Conventional drying and freeze drying.



3. Compare between the following :
 - i) Ultrafiltration with reverse osmosis
 - ii) Falling film evaporator with Climbing film evaporator
 - iii) Vat pasteurization with plate pasteurization.
4. In what way does the drying differ from evaporation ? Discuss the mechanism of drying.
5. Explain the function of the following parts in a double seaming machine :
 - i) Base plate
 - ii) Seaming chuck
 - iii) First operation seaming roll
 - iv) Second operation seaming roll.
6. Explain about the function and construction material of extrusion screw, barrel, die and cutter of a macaroni extruder.

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Discuss the operation of a double drum drier indicating its feeding arrangement.
- b) A food containing 80% water is to be dried at 100 degree centigrade down to moisture content of 10%. If the initial temperature of the food is 21 degree centigrade, calculate the quantity of heat energy required per kilogram weight of the original material for drying under atmospheric pressure.

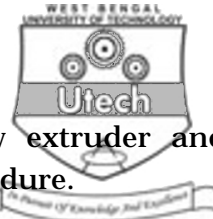
Given :

Latent heat of vaporization of water at 100 degree centigrade and standard atmospheric pressure = 2257 kJ/kg.

Specific heat capacity of food = 3.8 kJ/kg/degree centigrade.

10 + 5

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8. a) Draw a neat sketch of a single screw extruder and explain its operating principle and procedure.
b) Discuss about the type of twin screw extruder and its application and advantages. 8 + 7

9. a) Describe a vertical steam retort along with the general specifications of its various fittings and the cycle of its operation.
b) The diameter and length of a drum drier is 0.7 m and 0.85 m respectively. The feed enters at a preheated temperature of 100 degree centigrade and gets dried at 150 degree centigrade. The initial moisture content of the feed is 80% and it is to be dried to a moisture content of 20%.

Given the feed density = 1020 kg/m^3

The overall heat transfer coefficient = $1200 \text{ W/m}^2/\text{K}$.

The doctors blade removes the feed after every $\frac{3}{4}$ revolution of drum.

The feed layer thickness on the drum surface = 0.6 mm.

The latent heat of vaporization of product = 2.258×10^6 joule/kg.

Calculate the speed of the drum. 10 + 5

10. Write short notes on any *three* of the following : 3 × 5
- a) 2-stage homogenizer
 - b) Solar drier
 - c) Cryogenic freezer
 - d) Components of shell and tube heat exchanger
 - e) High speed dough mixer.
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