

**MAHARASHTRA ANIMAL AND FISHERY SCIENCES UNIVERSITY, NAGPUR**  
**SEMEISTER END THEORY EXAMINATION, B.Tech. Dairy Technology 2018-19**

Semester	: IV (New Syllabus)	Academic Year	: 2018-2019
Course No.	: DE-409	Course Title	: Dairy Process Engineering
Credits	: 2+1=3	Total Marks	: 50
Day & Date	: Tuesday, 25.06.2019	Time	: 15.00 to 17.00 Hrs.

- Note :** 1) Section "A" is Compulsory.  
2) Solve **Any Five** questions from **Section "B"**.  
3) The use of scientific tables, charts and calculator is allowed in case of engineering courses.

**SECTION - 'A'**

- Q.1 A) Choose the most appropriate answer from the options given below. (05)
- Milk is dried in spray drier .....
    - Under atmospheric condition
    - ☒ Under vacuum
    - Under pressure
    - None of these
  - The amount steam consumed per kg of water evaporated from the milk is called as .....
    - Steam Economy
    - ☒ Specific steam consumption
    - Evaporator Economy
    - None of these
  - Milk vapor in evaporator is condensed in .....
    - Cooling tower
    - Spray pond
    - Fourth effect
    - ☒ Condenser
  - In spray drier moisture of powder is controlled by .....
    - Feed rate
    - Inlet air temperature
    - Outlet air temperature
    - ☒ All of these
  - Homogenizer is connected in milk condensation and drying plant as.....
    - Agglomeration device
    - ☒ High pressure pump
    - Temperature booster
    - None of these
- B) Give answer in one line. (05)
- What is equilibrium moisture content?
  - Define wetting rate.
  - What is wet bulb temperature?
  - What do you understand by the term 'entrainment'?
  - Define Permeate.
- Q.2 A) Elaborate the following in relation to the course 'Dairy Process Engineering' (05)
- TVR
  - MVR
  - MEE
  - RO
  - MF

(P.T.O.)

- B) State whether True or False. If false, rewrite the statement after making necessary corrections. (05)
- MVR is more efficient than TVR.
  - Bulk density of milk powder influence directly packaging cost.
  - Pump is essential to carry the feed between the effects in forward feed multiple effect evaporator.
  - A rising film evaporator is suitable for products which are much sensitive to heat.
  - Centrifugal disc atomizers are preferred for horizontal dryers.

## SECTION – 'B'

- Q.3 What is the basic principle of a spray dryer? With the help of a neat sketch explain the operation of a spray drying plant for production of milk powder. (06)
- Q.4 Give the classification of different membrane processes used in food industry. Also write the basic principle of those processes. (06)
- Q.5 Juice containing 10 % solids ( $C_p = 3.89 \text{ kJ/kgK}$ ) is concentrated to 45 % solids ( $C_p = 2.85 \text{ kJ/kgK}$ ) in single stage evaporator which allows the transfer of heat at a rate of 30 kW. The feed enters evaporator at  $60^\circ\text{C}$  and vacuum maintained inside the evaporator allows the juice to boil at  $55^\circ\text{C}$ . Find the feed rate and specific steam consumption. (enthalpy of water vapour at  $55^\circ\text{C}$  is  $2604 \text{ kJ/kg}$ ) (06)
- Q.6 Write short note on:
- Pressure drop in fluidized bed. (02)
  - Constant rate drying. (02)
  - Water activity. (02)
- Q.7
- Explain Fluidized bed dryer. (03)
  - Explain Ultra filtration of milk. (03)
- Q.8 Answer in brief:
- How vacuum is maintained in multiple effect evaporator? (02)
  - State the expression used to calculate Total Drying Time. (02)
  - Why and where bag filters are used? (02)
- Q.9
- Describe the process of electro dialysis. (02)
  - Milk @  $1000 \text{ kg/hour}$  containing 80% moisture on (Dry Basis) is being dried to 10 % moisture (Dry Basis) using air entering at specific humidity of  $16 \text{ mg/kg}$  and leaving at specific humidity of  $38 \text{ mg/kg}$ . Find the mass flow rate of air required. (04)

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IV (NS)

Q. 1 A) Choose the most appropriate answer from the options given below.

- i) b) : Under vacuum
- ii) b) : Specific Steam Consumption
- iii) d) : Condenser
- iv) d) : All of these
- v) b) : High pressure pump

B) Give answer in one line.

- i) It is the moisture content of the food on dry basis when it is in thermodynamic equilibrium with the surrounding air
- ii) Amount of feed in evaporator distributed internally over the circumference of evaporator tube per unit its length.
- iii) Temperature of air measured by thermometer with its bulb covered with wet cloth of cotton.
- iv) The process of carrying over of the feed particles in the evaporator along with the vapours being formed and separated.
- v) The portion of fluid being passed through filtration membrane that can pass across the membrane.

Q. 2 A) Elaborate the following in relation to the course 'Dairy Process Engineering'

- i) TVR- Thermal vapor recompression
- ii) MVR- Mechanical vapor recompression
- iii) MEE- Multiple Effect Evaporator
- iv) RO- Reverse osmosis
- v) MF- Micro filtration

B) State whether True or False. If false, rewrite the statement after making necessary corrections.

- i) True
- ii) True
- iii) True
- iv) False : A rising film evaporator is suitable for products which are much sensitive to heat.
- v) True

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