

MAHARASHTRA ANIMAL AND FISHERY SCIENCES UNIVERSITY, NAGPUR
SEMESTER END THEORY EXAMINATION, B. Tech. (D.T.)

Semester : IV (V Dean)	Academic Year : 2021-2022
Course No. : DE- 410	Course Title : Dairy Process Engineering
Credits : (2+1=3)	Total Marks : 50
Day & Date : Monday, 05/09/2022	Time : 02:30 Hrs

Note : 1) All questions from **Section 'A'** are compulsory.
2) Solve **Any Three** questions from **Section 'B'**.
3) Draw neat and well labelled diagram wherever necessary.

SECTION –‘A’

Q. 1 A) Choose the most appropriate answer from the options given below. (05)

- i) Water activity is equals to
 - a) %ERH x 100
 - b) %ERH
 - c) %ERH /100
 - d) Absolute Humidity
- ii) The portion of solution that remains unfiltered during membrane processing is
 - a) Flux
 - b) Retentate
 - c) Permeate
 - d) Filtrate
- iii) The feed enters and comes out in random effect of an evaporator is characterized by
 - a) Forward feed
 - b) Backward feed
 - c) Parallel feed
 - d) Mixed feed
- iv) The pressure of motive steam use in TVR is
 - a) 1-2 psi
 - b) 6-8 bar
 - c) 6-8 psi
 - d) 1-2 bar
- v) In ice cream making fast freezing is essential for having a
 - a) Smooth product
 - b) Thick product
 - c) Hard product
 - d) Soft product

B) Define the following. (05)

- i) Steam economy
- ii) Flux/ flux rate
- iii) Boiling point elevation
- iv) Concentration polarization
- v) Diafiltration

Q. 2 A) Match the following. (05)

Column 'A'

- i) High Diameter Drying Chamber
- ii) Drum Dryer
- iii) TVR
- iv) RO
- v) Cyclone Separators

Column 'B'

- a) Concentration process
- b) Recovery System in Dryer
- c) Energy saving method in evaporator
- d) Short form Dryer
- e) Mixing Chamber
- f) Doctor Blade

(P.T.O.)

- B) State whether the following statements are True or False. If false, rewrite the statement after making necessary corrections. (05)
- More pressure is required in Microfiltration process as compare to RO process.
 - In TVR, high pressure steam is mixed with vapour generated from milk and the mixture is used again as heating medium.
 - Centrifugal disc atomizers are preferred for vertical spray dryers.
 - Hot air is used as heating medium in drum drying.
 - The steam economy of evaporators can be increase by wet scrubber.

SECTION –‘B’

- Q. 3 A) Give classification of evaporators. Explain one type in detail. (05)
 B) List the components of spray dryer system. Explain the importance of each component. (05)
- Q. 4 A) What is membrane? Discuss the membrane technologies and its applications. (05)
 B) Discuss the butter manufacturing process using continuous butter manufacturing machine. (05)
- Q. 5 A) Differentiate between falling film and rising film evaporators. (03)
 B) 150 kg of Paneer contains 61 kg of moisture. Find out the moisture content on wet basis. (03)
 C) Enlist and discuss the factors affecting the heat transfer coefficients in case of concentration of milk using multi effect evaporator. (04)
- Q. 6 A) Differentiate Reverse Osmosis v/s. Microfiltration. (03)
 B) Enlist various types of atomizers used in dairy industry and explain any one in brief. (03)
 C) Discuss the thermal vapour recompression system. (04)
- Q. 7 Milk @ 25000 kg/h containing 15% TS is concentrated in double effect evaporator. (10)
 The milk enters first effect at 40°C, where it is concentrated to 30% TS at 70°C and in second effect it is concentrated 40% TS at 45°C. Saturated steam 6 bar is used in first calandria. Assume C_p of milk as 3.89 kJ/kg K and no drop in condensate temp and calculate. (Neglect change in boiling point and specific heat due to concentration)
- Heat transfer area of first calandria, if OHTC is 1530 W/m²K.
 - Load on condenser
