

MAHARASHTRA ANIMAL AND FISHERY SCIENCES UNIVERSITY, NAGPUR
SEMESTER END THEORY EXAMINATION, *B.Tech. (D.T.) Degree Course 2017-18*

Semester	: IV (V Dean)	Academic Year	: 2017-2018
Course No.	: DE-410	Course Title	: Dairy Process Engineering
Credits	: 2+1=3	Total Marks	: 50
Day & Date	: Tuesday, 12.06.2018	Time	: 15.00 to 17.00 Hrs.

Note :

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

SECTION –‘A’

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

- In double effect evaporator, kg of steam is required to evaporate 1 kg of water.
 - 1
 - 1.2
 - 0.6
 - 0.2
- Unit of thermal diffusivity is
 - m^2/hr
 - $\text{m}^2/\text{hr } ^\circ\text{C}$
 - $\text{kcal}/\text{m}^2 \text{ hr}$
 - $\text{kcal}/\text{m. hr } ^\circ\text{C}$
- The evaporator consists of tubes and shell arrangement which is commonly known as
 - Vapour separator
 - Calandria
 - Condenser
 - All of these
- Direct stem injection (DSI) system in evaporator utilises
 - Culinary steam
 - Boiler steam
 - Filtered steam
 - None of these
- In a spray dryer, the inlet temperature of hot air is $^\circ\text{C}$
 - 200
 - 300
 - 110
 - None of these

B) Define the following (05)

- i) Steam economy
- ii) Agglomeration
- iii) Vapour recompression
- iv) Atomization
- v) Electrodialysis

Q. 2 A) State the reasons for the following. (05)

- Why there is temperature variation in first, second and third calandria of multiple effect evaporator?
- Why separator is attached to the calandria of evaporator?
- Why vacuum is created in vacuum pan evaporator and give reason for using vacuum ejector?
- Why spray drying is preferred over drum drying?
- Why fluidized bed dryers are used in powder drying?

(P.T.O.)

- B) State whether True or False. If false, rewrite the statement after making necessary corrections. (05)
- i) The performance of the thermal vapour compressor (TVR) depends on the pressure of the boiler steam.
 - ii) The mechanical vapour compressor (MVR) is used to raise the pressure and temperature of the vapour.
 - iii) A pump that takes suction at lower pressure below atmospheric and discharges against atmospheric pressure is called vacuum pump.
 - iv) Drying in the falling-rate period involves two processes.
 - v) Spray drying requires less energy than evaporation.

SECTION - 'B'

- Q. 3 A) State different types of dryers and explain the single stage spray dryer with neat sketch. (05)
- B) Discuss the drying curve with neat sketch. (05)
- Q. 4 A) What is an evaporator? Explain the flow of fluids (milk, vapour, condensed water and steam) in case of double effect falling film evaporator. (05)
- B) Enlist the various powder recovery systems for spray dryer and explain any two in detail. (05)
- Q. 5 A) Explain the working of fluidized bed drier in brief. (03)
- B) Explain the drying mechanism inside a spray dryer. (03)
- C) Explain the centrifugal atomizer with neat sketch. (04)
- Q. 6 A) Explain in detail ultrafiltration and reverse osmosis process with suitable example. (03)
- B) What is climbing film evaporator? Discuss the importance of falling film evaporator on climbing film evaporator in dairy industry. (03)
- C) With the help of neat and well labeled diagram explain the multistage spray dryer. (04)
- Q. 7 A juice containing 10% TS ($C_p = 3.89 \text{ kJ/kg K}$) is concentrated to 50 % TS in an evaporator. The feed is entering at 60°C and vacuum inside the evaporator allows the juice to boil at 55°C . If the feed rate is 1000 kg/hr , find the heat consumption, quantity of product formed and the vapour released (enthalpy of water vapour at 55°C is 2604 kJ/kg) (10)
