Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-IV (OLD) - EXAMINATION - SUMMER 2017

Subject Code: 141405

Subject Name: Principles Of Food Engineering

Time: 10:30 AM to 01:00 PM

Total Marks: 70

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Date: 12/06/2017

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q.1 (a) Two different mixtures of methanol and water are kept in separate tank. The first 07 mixture contains 40% wt methanol and second contains 30% wt water. Quantity of first mixture is 200g whereas 150g in second mixture. When they are mixed together, then what are the total mass and composition of the product?

(b)	Explain the role of bacteria in the spoilage of foods.	
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- Q.2 (a) Write short notes on:
 - i. Metals as a packaging material
 - ii. Aseptic processing of food
 - (b) A retort contains 1000 cans tomato soup. It is heated in bulk to a temperature of 07 105⁰C, maintained at this temperature for some time and subsequently cooled down to 42⁰C in the retort itself before being taken out. Calculate the amount of cooling water required to accomplish the requisite cooling. The given data are :

Cooling water inlet temperature : 16^{0} C Cooling water outlet temperature : 36^{0} C Mass of one empty can: 65 g Mass of tomato soup in each can : 500 g C_p (Can material) : 0.5 kJ/kgK C_p (Tomato soup): 4.12 kJ/kgK C_p (Water) : 4.186 kJ/kgK Heat content of retort above 42^oC: 1.6 x 10⁴ kJ Assume no heat loss from the system.

OR

(b) The temperature of three fruit juices F₁, F₂ and F₃ of equal mass are 13^oC, 20^oC and 07 30^oC respectively. The temperature when F₁ and F₂ are mixed is 17^oC and when F₂ and F₃ are mixed is 24^oC. What would be the temperature when F₁ and F₃ are mixed? Assume no heat losses during mixing.

Q.3	(a)	Define water activity and explain its importance in the shelf life of foods.	07
	(b)	Explain the following duly supported by process flow diagram and examples:	07
		(i) Distillation (ii) Extraction	

OR

Q.3 (a) Explain the following duly supported by process flow diagram and examples: 07 (i) Centrifugation (ii) Homogenization

- (**b**) Differentiate between;
 - i. Springiness and Gumminess
 - ii. Dynamic and Static angle of repose
 - iii. Sphericity and Roundness

Q.4 (a) Write short notes:

- i. Radappertization of food
- ii. Types of water
- (b) What is 'Thermal Death Time'? Explain the principles of thermal destruction of **07** spoilage microorganisms

OR

- Q.4 (a) Explain drying and evaporation of food products giving three examples for each. 07 100 kg of grapes is dried from 77 % moisture content (wet basis) to 33% moisture content (wet basis) at constant rate of 15 g/s in a tray dryer. Calculate the drying time in hours and the mass of the dried grapes in kg.
 - (b) Explain the following heat processes involved in food preservation with suitable 07 examples:

a) Pasteurization b) Sterilization c) Blanching d) Cooking

- Q.5 (a) What do you understand by rheological properties? Give the application of TPA in 07 food processing. With the help of graph explain Adhesiveness, Cohesiveness, Hardness and Chewiness.
 - (b) Explain in detail about the food irradiation process.

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OR

Q.5 (a) Name different types of dryers and evaporators used in food industry. A spherical 07 droplet of 110 μm diameter is being dried in a spray dryer from 65 % moisture content (wet basis) to 10 % moisture content (wet basis). The drying air temperature is 210 °C and the surface temperature of the droplet is 58 °C. Assuming that the droplet size remains constant and the drying takes place at constant rate, calculate the drying rate in μg/s.

Take $h = 225 \text{ W/m}^2 \text{ K}$ and $h_{fg} = 2371 \text{ kJ/kg}$

(b) What are the advantages of 'Form-Fill-Seal' machine and explain its working. 07

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