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| **Name:**<br>**Enrolment No:** | |

**UPES**

**End Semester Examination, May 2025**

**Course: Emerging Technologies in Food Processing** — **Semester: VI**

**Program: B.Tech. Food Technology** — **Duration: 3 Hours**

**Course Code: HSFT3013** — **Max. Marks: 100**

**Instructions: Read all the questions carefully.**

| S. No. | Section A<br>Short answer questions (MCQ/T&F)<br>(20Q x 1.5M= 30 Marks) | Marks | COs |
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| Q1 | **Dielectric heating is also known as:**<br>A) Microwave heating<br>B) Infrared heating<br>C) Resistance heating<br>D) Conduction heating | 1.5 | CO1 |
| Q2 | **The mechanism of dielectric heating involves:**<br>A) Conduction<br>B) Friction of molecules due to electric fields<br>C) Radiation<br>D) Evaporation | 1.5 | CO2 |
| Q3 | **Dielectric heating is commonly used in:**<br>A) Sterilizing dry powders<br>B) Deep frying<br>C) Boiling<br>D) Cold storage | 1.5 | CO4 |
| Q4 | **Ohmic heating works by passing:**<br>A) Light waves through food<br>B) Ultrasound through food<br>C) Electric current through food<br>D) High-pressure air through food | 1.5 | CO1 |
| Q5 | **Ohmic heating is most effective in:**<br>A) Highly viscous foods<br>B) Dry foods<br>C) Conductive liquid foods<br>D) Frozen foods | 1.5 | CO2 |
| Q6 | **Which of the following is a benefit of ohmic heating?**<br>A) Uneven heating<br>B) Formation of hotspots | 1.5 | CO1 |

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| | C) Rapid and uniform heating<br>D) Requires no electricity | | |
| Q7 | **Infrared heating primarily transfers heat via:**<br>A) Conduction<br>B) Convection<br>C) Radiation<br>D) Evaporation | 1.5 | CO1 |
| Q8 | **Infrared heating is ideal for:**<br>A) Deep freezing<br>B) Pasteurizing milk<br>C) Surface drying and baking<br>D) Pressure cooking | 1.5 | CO1 |
| Q9 | **Infrared radiation has a wavelength range of:**<br>A) 10–100 nm<br>B) 400–700 nm<br>C) 700 nm to 1 mm<br>D) 1 mm to 10 mm | 1.5 | CO1 |
| Q10 | **PEF is used to:**<br>A) Freeze food<br>B) Mechanically crush cells<br>C) Inactivate microorganisms<br>D) Increase water content | 1.5 | CO2 |
| Q11 | **PEF is most effective for:**<br>A) Solid dry foods<br>B) Frozen foods<br>C) Pumpable liquid foods<br>D) Non-conductive foods | 1.5 | CO4 |
| Q12 | **The mechanism behind PEF involves:**<br>A) Microwave energy<br>B) Mechanical pressure<br>C) Electrical breakdown of cell membranes<br>D) Chemical additives | 1.5 | CO3 |
| Q13 | **Pulsed light uses:**<br>A) Continuous UV radiation<br>B) Bursts of high-intensity light<br>C) Microwaves<br>D) Steam | 1.5 | CO4 |
| Q14 | **Pulsed light is effective in:**<br>A) Coloring food<br>B) Enhancing aroma | 1.5 | CO1 |

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| | C) Surface decontamination<br>D) Cooking meat | | |
| Q15 | **Ultrasound processing uses:**<br>A) Infrared rays<br>B) High-frequency sound waves<br>C) Low-pressure gas<br>D) Light beams | 1.5 | CO2 |
| Q16 | **A key effect of ultrasound in food is:**<br>A) Freezing<br>B) Cavitation<br>C) Radiation exposure<br>D) Osmosis | 1.5 | CO3 |
| Q17 | **High-pressure processing is also known as:**<br>A) Microwave processing<br>B) Baro-processing<br>C) Cryo-processing<br>D) Conduction processing | 1.5 | CO1 |
| Q18 | **HPP is effective in:**<br>A) Dehydrating food<br>B) Killing pathogens without heat<br>C) Irradiating food<br>D) Canning | 1.5 | CO2 |
| Q19 | **The pressure typically used in HPP is:**<br>A) 10–20 MPa<br>B) 100–300 MPa<br>C) 400–600 MPa<br>D) 800–1000 MPa | 1.5 | CO1 |
| Q20 | **Combining HPP with mild heat or other minimal techniques enhances:**<br>A) Color changes<br>B) Nutrient loss<br>C) Microbial inactivation<br>D) Freezing point | 1.5 | CO4 |
| **Section B<br>(4Q x 5M=20 Marks)** | | | |
| Q 1 | Define infrared heating and describe the factors that influence its effectiveness in food drying and surface treatment. | 5 | CO3 |
| Q 2 | Examine the physical and microbial changes that occur in foods subjected to high-pressure processing (HPP). | 5 | CO3 |

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| Q 3 | List the key advantages of ultrasound processing and describe how cavitation plays a role in its effectiveness. | 5 | CO2 |
| Q 4 | Differentiate between thermal and non-thermal food processing techniques. | 5 | CO4 |
| **Section C<br>(2Q x 15M=30 Marks)** | | | |
| Q 1 | Rakesh owns a food processing unit for multiple food products.<br>a) Write down different emerging technologies that can be used for a particular food product (Choose any food of your choice). **(5 marks)**<br>b) Describe the principle and working of four different emerging technologies that can be used for processing that food product. **(10 marks)** | 15 | CO4 |
| Q 2 | Devendra owns a fruit and vegetable processing unit. Answer the following questions:<br>a) Describe the process of pulsed electric field treatment. **(5 marks)**<br>b) Describe three different thermal emerging techniques. **(10 marks)** | 15 | CO4 |
| **Section D<br>(2Qx10M=20 Marks)** | | | |
| Q 1 | What is ultrasound processing? Describe the different modes of ultrasound processing. | 10 | CO2 |
| Q 2 | Describe the following processing techniques (**2 marks each**):<br>a) Infrared heating<br>b) Thermomanosonication<br>c) Radio frequency heating<br>d) Dielectric heating | 10 | CO2 |