

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)**

**CLASS: B. TECH
BRANCH: FOOD ENGINEERING AND TECHNOLOGY**

**SEMESTER : IV
SESSION : SP/2025**

SUBJECT: FE201 PRINCIPLE OF FOOD PROCESSING AND PRESERVATION

TIME: 3 HOURS

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
 2. Attempt all questions.
 3. The missing data, if any, may be assumed suitably.
 4. Before attempting the question paper, be sure that you have got the correct question paper.
 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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|---|----------------------|-----------------|-------------------|------------|----------------------|-----------------|-------------------|---|----|----|----|---|----|----|----|
| Q.1(a) Explain the reasons for food spoilage. Differentiate between sterilization and pasteurization. | [5] | 1,2 | 2 | | | | | | | | | | | | |
| Q.1(b) Determine the values of constants c and n from Henderson's equation for following data obtained under two different conditions of EMC studied of sunflower seed | [5] | 1,3 | 3 | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th style="width: 25%;">Conditions</th><th style="width: 25%;">Relative Humidity, %</th><th style="width: 25%;">Temperature, °C</th><th style="width: 25%;">EMC (% dry basis)</th></tr></thead><tbody><tr><td style="text-align: center;">1</td><td style="text-align: center;">50</td><td style="text-align: center;">40</td><td style="text-align: center;">10</td></tr><tr><td style="text-align: center;">2</td><td style="text-align: center;">70</td><td style="text-align: center;">50</td><td style="text-align: center;">13</td></tr></tbody></table> | | | | Conditions | Relative Humidity, % | Temperature, °C | EMC (% dry basis) | 1 | 50 | 40 | 10 | 2 | 70 | 50 | 13 |
| Conditions | Relative Humidity, % | Temperature, °C | EMC (% dry basis) | | | | | | | | | | | | |
| 1 | 50 | 40 | 10 | | | | | | | | | | | | |
| 2 | 70 | 50 | 13 | | | | | | | | | | | | |
| Q.2(a) Explain water activity. What do you understand about water sorption isotherms? With a suitable graph, explain the effect of water activity on enzyme reactions, nonenzymatic browning reactions, microbial growth and survival. | [5] | 3 | 2 | | | | | | | | | | | | |
| Q.2(b) You are supplied with two bags of maize each weighing 1.0 tonne. One bag has maize of 25% dry basis and the other contains maize of 25% wet basis. Which bag contains more dry matter? Justify your answer with calculations. | [5] | 3 | 3 | | | | | | | | | | | | |
| Q.3(a) Differentiate between D, Z and F value. What is principle and benefit of blanching? | [5] | 4 | 3 | | | | | | | | | | | | |
| Q.3(b) Estimate the spoilage probability of a 50-minute process at 113°C when $D_{113} = 4$ minutes and the initial microbial population is 10^4 per container. | [5] | 3 | 3 | | | | | | | | | | | | |
| Q.4(a) Differentiate between refrigeration, chilling and freezing. What are the problems associated with slow freezing over fast freezing? | [5] | 2 | 3 | | | | | | | | | | | | |
| Q.4(b) A spherical food product is being frozen in an air-blast freezer. The initial product temperature is 10°C and the cold air -40°C. The product has a 7 cm diameter with density of 1000 kg/m ³ , the initial freezing temperature is -1.25°C, the thermal conductivity of the frozen product is 1.2 W/(m K), and the latent heat of fusion is 250 kJ/kg. Convective heat-transfer coefficient $h_c = 50$ W/(m ² K). Compute the freezing time. | [5] | 3 | | | | | | | | | | | | | |
| Q.5(a) Difference between radappertization, radurization and radicidation . What does RADURA symbolize? | [5] | 2 | 2 | | | | | | | | | | | | |
| Q.5(b) What is hurdle technology? Explain with examples how fermentation acts as food preservation. | [5] | 3 | 2 | | | | | | | | | | | | |

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