JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -1 EXAMINATION- FEB-2023

COURSE CODE(CREDITS): 21B1WBT831 (03) MAX. MARKS: 15

COURSE NAME: Food Processing and Engineering

COURSE INSTRUCTORS:Dr Anil Kant MAX. TIME: 1 Hour

Note: *All questions are compulsory. Marks are indicated against each question in square brackets. Use of calculator and steam table is allowed. Steam table is provided overleaf.*

Q.1 Briefly answer following questions [3.0] CO-1

a. Separate out and interpret different elements which are essential for a food production method to be called as food processing/Technology? Give examples
b. Mention any two historical developments which are considered as starting points of modern food technology in your opinion. Give reason as well.
c. Food processing infrastructure and culture can result in justifiable income to farmers and tantamount to food production. Justify

Q.2 Using a steam table provided overleaf, calculate empathy of 8 kg of 90% dry steam held at a pressure of 70.11kN/m2. [3.0] CO-3

Q.3 Draw labeled "temperature- heat" diagram of water and steam and explain following terms.i) sensible heat ii) Enthalpy of superheated steam iii) Dryness fraction steam [3.0] CO-3

Q.4 Figure out the differences in temperature profile under co-current and counter-current flow conditions in a heat exchanger? [3.0] CO-3

Q.5 Draw a well labeled diagram of the Loefeller boiler and explain its key components along with their role. [3.0] CO-4

I A

Properties of Saturated Water and Steam

Temperature t, °C	Saturation pressure p, kN/m²	Density ρ, kg/m³		Specific volume v, m³/kg		Specific heat capacity C_p, kJ/kg K		Viscosity μ, mNs/m²		Thermal conductivity k, W/mK		Prandtl number N_{Pr} ($C_p\mu/k$) dimensionless		Surface tension σ, mN/m	Volume expansion coefficient β^1, K⁻¹	Compressibility k, bar⁻¹
		Water	Steam	Water	Steam	Water	Steam	Water	Steam	Water	Steam	Water	Steam		Water	
0.01	0.611	1000	0.004855	0.00100	206.2	4.217	1.854	1.755	0.0088	0.569	0.0173	13.02	0.942	75.6	0.060×10^{-3}	50.96×10^{-6}
10	1.227	1000	0.009949	0.00100	106.4	4.193	1.860	1.301	0.0091	0.587	0.0185	9.29	0.915	74.2	0.088×10^{-3}	47.89×10^{-6}
20	2.34	998	0.01483	0.00100	57.8	4.182	1.869	1.002	0.0094	0.603	0.0191	6.95	0.918	72.8	0.207×10^{-3}	45.91×10^{-6}
30	4.24	996	0.0304	0.00100	32.9	4.179	1.875	0.797	0.0097	0.618	0.0198	5.39	0.923	71.2	0.303×10^{-3}	44.75×10^{-6}
40	7.38	992	0.0513	0.00101	19.5	4.179	1.885	0.651	0.0101	0.632	0.0204	4.31	0.930	69.6	0.385×10^{-3}	44.22×10^{-6}
50	12.34	988	0.083	0.00101	12.05	4.181	1.899	0.544	0.0104	0.643	0.0210	3.53	0.939	67.9	0.458×10^{-3}	44.17×10^{-6}
60	19.92	983	0.130	0.00102	7.68	4.185	1.915	0.462	0.0107	0.653	0.0217	2.96	0.947	66.2	0.523×10^{-3}	44.50×10^{-6}
70	31.16	978	0.198	0.00102	5.05	4.190	1.936	0.400	0.0111	0.662	0.0224	2.53	0.956	64.4	0.584×10^{-3}	45.15×10^{-6}
80	47.36	972	0.293	0.00103	3.41	4.197	1.962	0.350	0.0114	0.670	0.0231	2.19	0.966	62.6	0.641×10^{-3}	46.10×10^{-6}
90	70.11	965	0.423	0.00104	2.36	4.205	1.992	0.311	0.0117	0.676	0.0240	1.93	0.976	60.7	0.696×10^{-3}	47.34×10^{-6}
100	101.3	958	0.598	0.00104	1.673	4.216	2.028	0.278	0.0121	0.681	0.0249	1.723	0.986	58.9	0.750×10^{-3}	48.90×10^{-6}
125	232.1	939	1.30	0.00107	0.770	4.254	2.147	0.219	0.0133	0.687	0.0272	1.358	1.047	–	–	–
150	476.0	917	2.55	0.00109	0.392	4.310	2.314	0.180	0.0144	0.687	0.0300	1.133	1.110	–	–	–
175	892.7	893	4.90	0.00112	0.217	4.389	2.542	0.153	0.0156	0.679	0.0334	0.990	1.185	–	–	–
200	1555.0	863	7.87	0.00116	0.127	4.497	2.843	0.133	0.0167	0.665	0.0375	0.902	1.270	–	–	–
225	2550	833	12.80	0.00120	0.0783	4.648	3.238	0.1182	0.0179	0.644	0.0427	0.853	1.36	–	–	–
250	3978	800	20.00	0.00125	0.0500	4.867	3.772	0.1065	0.0191	0.616	0.0495	0.841	1.45	–	–	–
275	5949	758	30.60	0.00132	0.0327	5.202	4.561	0.0972	0.0202	0.582	0.0587	0.869	1.56	–	–	–
300	8597	712	46.30	0.00140	0.0216	5.762	5.863	0.0897	0.0214	0.541	0.0719	0.955	1.74	–	–	–

(contd.)