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**JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT**

**TEST -3 EXAMINATIONS- 2026**

**B.Tech.-VIII Semester (BT)**

**COURSE CODE (CREDITS):** 21B1WBT831(03)

**MAX MARKS:** 35

**COURSE NAME:** Food Processing and Engineering

**COURSE INSTRUCTOR:** Dr Anil Kant, Dr Ashok Nadda

**MAX. TIME:** 2 Hours

**Note:** (a) All questions are compulsory. (b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems (c) Use of calculator is allowed

| Q.No | Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | CO   | Marks                  |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------------------------|
| Q.1  | <p>a. Give only one key difference between i) Fire tube boiler and water tube boiler ii) natural circulation boiler and Forced circulation boiler.</p> <p>b. Why a normal baker's yeast strains use glucose, maltose and sucrose in a given sequence.</p> <p>c. What is gluten? How is it formed upon hydration of flour and what role does it play in bread leavening?</p> <p>d. It was found that wheat flour was deficient in gluten forming proteins? Give two possible methods to improve the dough structure.</p> <p>e. Explain the role of following in bread dough i) cysteine ii) shortening fats</p> <p>f. What optional components are added in bread dough for i) increasing yeast growth ii) enhancing shelf life of bread? Mention the reasons</p> <p>g. With what purpose does <math>\alpha</math>-amylase are added to bread dough? How bacterial, fungal and malt <math>\alpha</math>-amylase differ?</p> <p>h. Why baker' yeast in bread dough resort to anaerobic metabolism? Give three reasons.</p> |      | 8                      |
| Q.2  | <p>a. A packaged snack product becomes rancid before its expiry date. Analyze the possible packaging failures responsible for this problem.</p> <p>b. What is primary and secondary packaging? Discuss any five types of different packaging materials used for food products and their properties.</p> <p>c. How does modified atmosphere packaging (MAP) and controlled atmosphere packaging(CAP) differ from each other? Compare their applications in food preservation.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Co-5 | 3x3=9                  |
| Q.3  | <p>a. Explain co-current and counter-current flow conditions in a heat exchanger? Discuss important points of temperature profile during these flow conditions.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      | 3x2=6<br><b>P.T.O.</b> |



|     |                                                                                                                                                                                                                                                                                                                                                                |  |       |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------|
|     | b. Describe the design features and working of following equipments i) Plate heat exchanger, ii) heat exchanger vessels with external heat source                                                                                                                                                                                                              |  |       |
| Q.4 | <p>a. Draw a labeled diagram of the Cochran boiler. What is the exact function of i) fusible plug ii) blow off cock.</p> <p>b. Draw a labelled diagram of LaMount boiler and explain two subparts included to extract maximum heat from escaping hot flue gases.</p>                                                                                           |  | 4x2=8 |
| Q.5 | <p>Explain milk, acidification and coagulation steps of cheese production? Include purpose, bacterial species in starter cultures, enzyme and method involved.</p> <p><b>or</b></p> <p>Calculate the difference of total heat (enthalpy) of 8 Kg water at 25 °C and 5kg steam held at pressure of 1.5 MN/m<sup>2</sup>. Given 1 bar = 0.1 MN/m<sup>2</sup></p> |  | 4     |



# Properties of Saturated Steam at Different Temperatures

| Temperature<br>$t$ , °C | Pressure<br>$p$ , bar | Specific volume<br>$v$ , m <sup>3</sup> /kg |                            | Specific enthalpy,<br>kJ/kg |        | Specific entropy,<br>kJ/kg K |        |
|-------------------------|-----------------------|---------------------------------------------|----------------------------|-----------------------------|--------|------------------------------|--------|
|                         |                       | $v_f$ , m <sup>3</sup> /kg                  | $v_g$ , m <sup>3</sup> /kg | $h_f$                       | $h_g$  | $s_f$                        | $s_g$  |
| 0                       | 0.00611               | 0.0010002                                   | 206.2                      | -0.04                       | 2501.6 | -0.0002                      | 9.1577 |
| 2                       | 0.00706               | 0.0010001                                   | 179.9                      | 8.39                        | 2505.2 | 0.0306                       | 9.1047 |
| 4                       | 0.00813               | 0.0010000                                   | 157.3                      | 16.80                       | 2508.9 | 0.0611                       | 9.0526 |
| 6                       | 0.00935               | 0.0010000                                   | 137.8                      | 25.21                       | 2512.6 | 0.0913                       | 9.0015 |
| 8                       | 0.01072               | 0.0010001                                   | 121.0                      | 33.60                       | 2516.2 | 0.1213                       | 8.9513 |
| 10                      | 0.00123               | 0.0010003                                   | 106.4                      | 41.99                       | 2519.9 | 0.1510                       | 8.9013 |
| 15                      | 0.01704               | 0.0010008                                   | 77.98                      | 62.94                       | 2529.1 | 0.2243                       | 8.7826 |
| 20                      | 0.0237                | 0.0010017                                   | 57.84                      | 83.86                       | 2538.2 | 0.2963                       | 8.6684 |
| 25                      | 0.03166               | 0.0010029                                   | 43.40                      | 101.77                      | 2547.3 | 0.3670                       | 8.5592 |
| 30                      | 0.04241               | 0.0010043                                   | 32.93                      | 125.66                      | 2556.4 | 0.4365                       | 8.4546 |
| 35                      | 0.05622               | 0.0010060                                   | 25.24                      | 146.56                      | 2565.4 | 0.5049                       | 8.3543 |
| 40                      | 0.07375               | 0.0010078                                   | 19.55                      | 167.45                      | 2574.4 | 0.5721                       | 8.2583 |
| 45                      | 0.09582               | 0.0010099                                   | 15.28                      | 188.35                      | 2583.3 | 0.6383                       | 8.1776 |
| 50                      | 0.12335               | 0.0010121                                   | 12.05                      | 209.26                      | 2592.2 | 0.7035                       | 8.0776 |
| 55                      | 0.15741               | 0.0010145                                   | 9.579                      | 230.17                      | 2601.0 | 0.7677                       | 7.9926 |
| 60                      | 0.19920               | 0.0010171                                   | 7.679                      | 251.09                      | 2609.7 | 0.8310                       | 7.9108 |
| 65                      | 0.2501                | 0.0010199                                   | 6.202                      | 272.02                      | 2618.4 | 0.8933                       | 7.8322 |
| 70                      | 0.3116                | 0.0010228                                   | 5.046                      | 292.97                      | 2626.9 | 0.9548                       | 7.7565 |
| 75                      | 0.3855                | 0.0010259                                   | 4.143                      | 313.94                      | 2635.4 | 1.0154                       | 7.6835 |
| 80                      | 0.4736                | 0.0010292                                   | 3.409                      | 334.92                      | 2643.8 | 1.10753                      | 7.6132 |
| 85                      | 0.5780                | 0.0010326                                   | 2.829                      | 355.92                      | 2652.0 | 1.1343                       | 7.5454 |
| 90                      | 0.7011                | 0.0010361                                   | 2.361                      | 376.94                      | 2660.1 | 1.1925                       | 7.4799 |
| 95                      | 0.8453                | 0.0010399                                   | 1.982                      | 397.99                      | 2668.1 | 1.2501                       | 7.4166 |
| 100                     | 1.0133                | 0.0011437                                   | 1.673                      | 419.06                      | 2676.0 | 1.3069                       | 7.3554 |
| 105                     | 1.2080                | 0.0010477                                   | 1.419                      | 440.17                      | 2683.7 | 1.3630                       | 7.2962 |
| 110                     | 1.4327                | 0.0010519                                   | 1.210                      | 461.32                      | 2693.0 | 1.4185                       | 7.2388 |

(contd.)



(contd.)

| Temperature<br>$t$ , °C | Pressure<br>$p$ , bar | Specific volume<br>$v$ , m <sup>3</sup> /kg |                            | Specific enthalpy,<br>kJ/kg |        | Specific entropy,<br>kJ/kg K |        |
|-------------------------|-----------------------|---------------------------------------------|----------------------------|-----------------------------|--------|------------------------------|--------|
|                         |                       | $v_f$ , m <sup>3</sup> /kg                  | $v_g$ , m <sup>3</sup> /kg | $h_f$                       | $h_g$  | $s_f$                        | $s_g$  |
| 115                     | 1.6906                | 0.0010562                                   | 1.036                      | 482.50                      | 2698.7 | 1.4733                       | 7.1832 |
| 120                     | 1.9854                | 0.0010606                                   | 0.8915                     | 503.72                      | 2706.0 | 1.5276                       | 7.1293 |
| 125                     | 2.3210                | 0.0010652                                   | 0.7702                     | 524.99                      | 2719.9 | 1.5813                       | 7.0769 |
| 130                     | 2.7013                | 0.0010700                                   | 0.6681                     | 546.31                      | 2719.9 | 1.6344                       | 7.0261 |
| 135                     | 3.131                 | 0.0010750                                   | 0.5818                     | 567.68                      | 2726.6 | 1.6869                       | 6.9766 |
| 140                     | 3.614                 | 0.0010801                                   | 0.5085                     | 589.10                      | 2733.1 | 1.7390                       | 6.9284 |
| 145                     | 4.155                 | 0.0010853                                   | 0.4460                     | 610.60                      | 2739.3 | 1.7906                       | 6.8815 |
| 150                     | 4.760                 | 0.0010908                                   | 0.3924                     | 632.15                      | 2745.4 | 1.8416                       | 6.8358 |
| 155                     | 5.433                 | 0.0010964                                   | 0.3464                     | 653.78                      | 2751.2 | 1.8923                       | 6.7911 |
| 160                     | 6.181                 | 0.0011022                                   | 0.3068                     | 675.47                      | 2756.7 | 1.9425                       | 6.7475 |
| 165                     | 7.008                 | 0.0011082                                   | 0.2724                     | 697.25                      | 2762.0 | 1.9925                       | 6.7075 |
| 170                     | 7.920                 | 0.0011145                                   | 0.2426                     | 719.12                      | 2767.1 | 2.0416                       | 6.6630 |
| 175                     | 8.924                 | 0.0011209                                   | 0.2165                     | 741.07                      | 2771.8 | 2.0906                       | 6.6221 |
| 180                     | 10.027                | 0.0011275                                   | 0.1938                     | 763.12                      | 2776.3 | 2.1393                       | 6.5819 |
| 185                     | 11.233                | 0.0011344                                   | 0.1739                     | 785.26                      | 2780.4 | 2.1876                       | 6.5424 |
| 190                     | 12.551                | 0.0011415                                   | 0.1563                     | 807.52                      | 2784.3 | 2.2356                       | 6.5036 |
| 195                     | 13.987                | 0.0011489                                   | 0.1408                     | 829.88                      | 2787.8 | 2.2830                       | 6.4654 |
| 200                     | 15.549                | 0.0011565                                   | 0.1272                     | 852.37                      | 2790.9 | 2.3307                       | 6.4278 |
| 205                     | 17.243                | 0.0011644                                   | 0.1150                     | 874.99                      | 2793.8 | 2.3778                       | 6.3906 |
| 210                     | 19.077                | 0.0011726                                   | 0.1042                     | 897.74                      | 2796.2 | 2.4247                       | 6.3539 |
| 215                     | 21.060                | 0.0011811                                   | 0.09463                    | 920.63                      | 2798.3 | 2.4713                       | 6.3176 |
| 220                     | 23.198                | 0.0011900                                   | 0.08604                    | 943.67                      | 2799.9 | 2.5178                       | 6.2817 |
| 225                     | 25.501                | 0.0011992                                   | 0.07835                    | 966.89                      | 2801.2 | 2.5641                       | 6.2461 |
| 230                     | 27.976                | 0.0012087                                   | 0.07145                    | 990.26                      | 2802.0 | 2.6102                       | 6.2107 |

Source: *Steam Tables: Thermodynamic Properties of Water including Vapour Liquid and Solid Phases Metric Units*, Keenan, J.H., Keyes, F.G., Hill, P.G. and Moore, J.G. Copyright (1969); Reprinted with permission of John Wiley and Sons, Inc.