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

CLASS: IMSc **SEMESTER : IV**
BRANCH: FOOD TECH. **SESSION : SP/19**

SUBJECT: IMF4001 FOOD ENGG. – I FLUID FLOW & MECHANICAL OPERATIONS
TIME: 3.00 Hrs. **FULL MARKS: 60**

INSTRUCTIONS:
1. The question paper contains 7 questions each of 12 marks and total 84 marks.
2. Candidates may attempt any 5 questions maximum of 60 marks.
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.

Q.1(a) Define latent heat and sensible heat. [2]

Q.1(b) A wet food product contains 70% water. After drying, it is found that 80% of original water has been removed. Determine: [4]
i. Mass of water removed per kilogram of wet food and
ii. Composition of dried food

Q.1(c) 5 Kg of ice at -10^0C is heated to melt it into water at 0^0C; then additional heat is added to vaporize the water into steam. The saturated vapors exit at 100^0C. Determine the different enthalpy values involved in the process. Specific heat of ice is 2.05 kJ/(kg ^{0}C). Specific heat of water is 4.182 kJ/(kg ^{0}C), latent heat of fusion is 333.2 kJ/kg, and latent heat of vaporization at 100^0C is 2257.06 kJ/kg. [6]
Note that temperature remains constant in regions that involve latent heat.

Q.2(a) What are the essential requirements of a good material handling system? [2]

Q.2(b) What is aspiration and abrasive cleaning? [4]

Q.2(c) Explain different wet cleaning methods. [6]

Q.3(a) What do you mean by sorting and grading? [2]

Q.3(b) Explain: [4]
i. Open circuit grinding
ii. Free crushing
iii. Choke feeding grinding
iv. Closed circuit grinding

Q.3(c) Food is milled from 6 mm to 0.0012 mm using a 10 hp motor. Determine this motor be adequate to reduce the size of the particles to 0.0008 mm or not? Assume Rittinger's equation and 1 hp = 745.7 W. [6]

Q.4(a) What is cold extruder and extruder cookers? [2]

Q.4(b) What is electrostatic precipitator? Explain with neat diagram. [4]

Q.4(c) Explain different types of mixing equipments for liquid of low or moderate viscosity. [6]

Q.5(a) Define Filter aids and rate of filteration. [2]

Q.5(b) What is the working principle of centrifugal filtration? [4]

Q.5(c) What is classifier? Explain principal classifier methods. [6]

Q.6(a) Define surface tension and viscosity. [2]

Q.6(b) A simple U-tube manometer is installed across an orifice meter. The manometeric fluid is mercury (specific gravity 13.6) and flowing fluid through piping is carbon tetrachloride (specific gravity 1.6). The manometer reads 200 mm. what is the pressure difference over a manometer in N/m^2? (Density of water is 1000 kg/m^3) [4]

Q.6(c) Derive an expression to calculate discharge or volumetric flow rate through the pipe using venturi meter. [6]

Q.7(a) List the factors that cause minor and major frictional energy loss for a liquid flowing in a pipe. [2]

Q.7(b) What is the difference between centrifugal and reciprocating pumps? [4]

Q.7(c) Write in brief with neat sketch on reciprocating pump. [6]

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