Roll No. _____

2019
1st Sem

M.Tech. Food Technology
I Semester Examination 2019
Paper Title: Engineering Properties of Food
Paper Code: MFTD- 107

Time: 3 hours ***Max Marks: 75***

Attempt all the questions. Marks are mentioned against each question

Q1. Answer the following questions with the appropriate answers. **(1x15)**

a. Rheological science deals with the deformation and _____ of the material under action of applied force.

b. At constant stress, the deformation with time when the material is suddenly subjected to a dead load is called_____.

c. SI unit of heat capacity is
   A. Joule
   B. joule/(kilogram × kelvin)
   C. joule/kilogram
   D. joule/kelvin

d. Specific heat capacity of a substance is equal to
   A. mass of the substance × heat capacity
   B. mass of the substance/heat capacity
   C. heat capacity/mass of the substance
   D. None of the above

e. Assuming heat capacity of a 10 g of water to be 42 J/K, heat required to raise its temperature from 25 °C to 35 °C would be
   A. 42 J
   B. 4200 J
   C. 420 J
   D. None of the above

f. Units for thermal conductivity
   A. J/kg.K
   B. J.ohm/sec.K2
   C. J/mol.K
   D. W/m.K

g. When one end of the rod is heated, the molecules at the hot end vibrate with higher amplitude and transmit the heat from one particle to the adjacent particle and so on. What is the process?
   A. Convection
   B. Radiation
   C. Conduction
   D. Transmittance

h. Measure of temperature difference by which an object or material resists a heat flow is called
   A. thermal conductance
   B. thermal inductance
   C. thermal resistance
   D. thermal energy

i. For non-polar molecules, there is no absorption or emission in the range of infrared.
   A. True
   B. False

j. Dielectric properties depends on
   A. Temperature
   B. Composition and structure of material
   C. Density
   D. All of the above

k. The ability to dissipate heat is
   A. Dielectric constant
   B. Both A. & B.
   C. Dielectric Loss factor
   D. None

l. Current in a circuit depends on
   A. Resistance
   B. both A and B
   C. potential difference
   D. e.m.f

m. Dielectric heating of food results in
   A. Uniform heating
   B. Uniform and fast heating
   C. Fast heating
   D. None

n. Which of the following is a synonym for loss factor of food?
   A. Loss tangent
   B. Loss tangent & Dielectric loss
   C. Dielectric loss
   D. None of the mentioned

P.T.O.

o. Any food item should be subjected to micro frequencies such that, the dielectric constant is _____ and loss factor is _____.

A. Maximum, minimum
B. Minimum, minimum
C. Maximum, maximum
D. Minimum, maximum

Q2. Answer ***any three*** of the following **(5x3)**

a. Define the terms porosity, bulk density and true density, and describe the relation between the three.
b. Define angle of repose and explain a method for determination of angle of repose.
c. Calculate Reynolds number, if a fluid having viscosity of 0.4 Ns/m^2 and relative density of 900 Kg/m^3 through a pipe of 20mm with a velocity of 2.5 m.
d. Calculate the sphericity of a cylindrical object of diameter 2.0 cm and height 4 cm.
e. Define roundness, sphericity and aspect ratio.

Q3. Answer ***any three*** of the following **(5x3)**

a. Explain the factors affecting the electrical conductivity of solid and liquid foods.
b. Discuss the basic principles of Radiofrequency and Microwave heating.
c. Describe the influence of structure of food on thermal conductivity.
d. A 500 gram cube of lead is heated from 25 °C to 75 °C. How much energy was required to heat the lead? The specific heat of lead is 0.129 J/g°C.
e. Two parallel plates are 0.1 m apart. The bottom plate is stationary while the upper one is moving with a velocity *V*. The fluid between the plates is water, which has a viscosity of 1 cp.
   i. Compute the momentum flux required to maintain the top plate at a velocity of 0.30 m/s.
   ii. If the fluid between the plates is replaced with another fluid of viscosity 100 cp, and the momentum flux remains constant (similar to the one under a. above), calculate the new velocity if the plate.

Q4. Answer ***any three*** of the following **(5x3)**

a. What do you understand by Rheology? What is its application in food quality measurement?
b. What do you understand by Newtonian and non-Newtonian liquid foods? Explain with the help of suitable examples. How kinematic viscosity is measured?
c. What do you understand by visco-elastic materials? Explain these with the help of RELAXATION and CREEP curves.
d. Classify various textural measurements giving their definitions in detail.
e. How will you determine the following with the help of a typical Texture Profile Curve?
   (i) Cohesiveness (ii) Adhesiveness
   (iii) Springiness (iv) Gumminess.

Q5. Answer ***any three*** of the following **(5x3)**

a. Enlist the various engineering properties of biological materials relevant to agricultural processing and food engineering.
b. Discuss in brief the importance of various engineering properties in agricultural processing.
c. What are the applications of engineering properties in handling and processing equipment?
d. What is viscosity? Explain the methods of measurement of viscosity.
e. Explain stress strain behavior of agricultural produce under uniaxial compression and tension.

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