KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Agrl. Engg.) 2023 Admission
I Semester Final Examination - February 2024

Fape.1101 **Engineering Properties of Agricultural Produce (1+1)** **Marks:50**
Time: 2 hours

I **Fill in the blanks** **(10x1=10)**

1. Terminal velocity of wheat varies from ---------- to ----------m/s.
2. Viscosity of gas ---------- with increase in temperature.
3. Thermal conductivity ---------- with the increase of moisture content.
4. Unit of thermal diffusivity is----------

Define the following

5. specific heat

Choose the correct answer

6. Which of the following pigment is present in carrot?
   (a) cartenoids
   (b) flavonoids
   (c) anthocyanin
   (d) polyphenols
7. Angle of repose of paddy grain is (degree)
   (a) 20-25
   (b) 23-28
   (c) 30-45
   (d) 35-40
8. A cyclone separator works on the principle of ---------- force.
   (a) Centrifugal force
   (b) reciprocating force
   (c) Rolling force
   (d) Frictional force
9. The higher values of angle of internal friction indicates that the material is
   (a) normal flow
   (b) free flowing
   (c) cohesive
   (d) No indication of flow
10. Heat of vapourization of moist grain ---------- with temperature at constant moisture content.
    (a) increases
    (b) decreases
    (c) remains constant
    (d) None of these

II **Write short notes on ANY FIVE of the following** **(5x2=10)**

1. Angle of repose and angle of internal friction
2. Maxwell and Kelvin rheological models
3. Freezing point and boiling point requirement of refrigerant

4. Dielectric properties of foods
5. Derive relationship between bulk density, true density and porosity
6. Pseudoplastic and Dialant fluid
7. Frictional properties of food

III **Answer ANY FIVE of the following** **(5x4=20)**

1. If the specific heat of a bone dry material is 0.35 k Cal/kg °C, then what would be the specific heat of a commodity having 80 % moisture? If the same food is dried up to 60 % moisture, then what will be its specific heat? Discuss the effect of moisture content on specific heat of a food. (The specific heat of a solid food components are normally 0.35-0.45 k Cal/kg °C, and that of water is 1 k Cal/kg °C.
2. It is desired to freeze 15 Tonnes of fish per day from initial temperature of 10 °C to final temperature of -8 °C using a stream of air. Estimate total heat to be removed. Specific heat below freezing is 1.67 kJ/kg °C and above freezing is 3.18 kJ/kg °C. Latent heat of fusion is 276 kJ/kg
3. The volume of a pea was measured to be 2700 mm^3 by liquid displacement method. Find out equivalent diameter and sphericity of grain if radius of minimum circumscribing circle is 9 mm. determine roundness if projected area was measured to be 180 mm^2.
4. A 5 m high and 12 m long composite wall of a cold storage is made up of 100 mm thick brick wall as the outer wall. The inner wall is of fibre glass of 60 mm thick. in between the two wall an insulating board 20 mm is placed. The coeffients of thermal conductivity for the three layers are given below:
   Brick wall = 1.45 w/m-K, Fibre glass= 0.04 W/m-K, Insulating board = 0.06 W/m-K
   If the outside temperature is 27 °C and cold room temperature is 8°C. Calculate the heat loss per hour through the wall. Also determine the interface temperatures.
5. Derive expression for drag coefficient and terminal velocity.
6. Calculate the amount of ice required to cool 100 kg of tomato from 40°C tto 15°C if only latent heat of fusion is available for cooling. The specific heat of mango is 3.6 kJ/kg.K. The latent heat of fusion is 335 kJ/kg.
7. The weight of apple is 115 gm brfore waxing. After waxing the weight of apple becomes 122 gm. determine the surface area of apple. The thickness of wax coating is 1.2 mm over the apple & density of wax is 912 kg/m^3. Mention the effect of moisture content on angle of repose.

IV **Write an essay on ANY ONE of the following** **(1x10=10)**

1. Describe about applications of different engineering properties of food in designing of any equipment/ structure giving examples.
2. Describe about different physical and mechanical properties of food.

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