Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) - EXAMINATION – SUMMER 2017

Subject Code: 2151404 **Date: 03/05/2017**

Subject Name: Food Engineering Operations-I

Time:02:30 PM to 05:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 Short Questions 14

1 What is mesh?

2 The speed of ball mills normally kept is .....rpm

3 Angle of nip for roll crusher is 16º. (True/False)

4 Define diffusivity

5 Kanaj is a traditional storage structure. (True/False)

6 Which of the following is not categorized as a “mechanical operation” ?

a. Agitation
b. Size reduction
c. Humidification

7 Bucket conveyor is used to trasport material horizontally. (True/False)

8 For sizing of fine materials, the most suitable equipment is a

a. grizzly
b. trommels
c. shaking screens
d. vibrating screens

9 Define terminal velocity.

10 Two particles are called to be equal settling, if they are having the same.

a. Size
b. Shape
c. Terminal settling velocity in the same fluid

11 What are the size reduction laws?

12 Define Drag co-efficient

13 What is sphericity?

14 Define Static angle of repose

Q.2 (a) Discuss direct damages to grains during storage. 03

(b) Explain in detail any two unconventional storage structures. 04

(c) Define the angle of repose and briefly describe the factors affecting the angle of repose. Write a procedure to measure angle of repose of a grain with help of a labeled diagram and formula. 07

OR

(c) State Fick's law of diffusion and explain mechanism of diffusion in detail. 07

Q.3 (a) Perform cummulative screen analysis calculations for the following: 03

Screen mesh	Weight (gm)
+6	0.4
-6+8	47.3
-8+10	56.6
-10+14	45.1
-14+28	60.1
-28+65	65
-65+100	16.4
-100	98.5
Total	389.4

(b) Define screen effectiveness and Write the formula for screen effectiveness indicating each variable. 04

(c) What are the different criteria for selection of proper conveying system? Explain construction and working of belt conveyor. 07

OR

Q.3 (a) In a ball mill of diameter 2000 mm, 100 mm dia steel balls are being used for grinding. Presently, for the material being ground, the mill is run at 15 rpm. At what speed will the mill have to be run if the 100 mm balls are replaced by 50 mm balls, all the other conditions remaining the same? 03

(b) What is screening? Explain in detail about trommels. 04

(c) Draw and explain Ball mill in detail. 07

Q.4 (a) Differentiate between static and dynamic angle of repose. 03

(b) Write a short note on specific gravity separator. 04

(c) Derive the following equations for conductive heat transfer through a tubular pipe; 07

$$q_r = \frac{T_i - T_o}{\dfrac{Ln\left(r_o/r\right)}{2\Pi L K}}$$

OR

Q.4 (a) Discuss the followings: 03

1. Newtonian fluids
2. Textural profile analysis

(b) Write a short note on liquid-gas mass transfer. 04

(c) Describe the importance of radiation heat transfer. Explain absorbivity, reflectivity, transmissivity and emissivity. What is Kirchhoff's law and Stefan-Boltzmann law? 07

Q.5	(a)	The steady-state temperature distribution in a one–dimensional slab of thermal conductivity 50W/m.K and thickness 50 mm is found to be $T= a+bx^2$, where $a=200^0C$, $b=-2000^0C/ m^2$, T is in degrees Celsius and x in meters. What is the heat generation rate in the slab?	03
	(b)	Derive an equation for sphericity of a particle.	04
	(c)	What is the importance of terminal velocity? Derive the following equations for spherical body	07

$$V_t = \left[\frac{4g\, d_p\, (\rho_p - \rho_f)}{3\rho_f\, C} \right]^{1/2}$$

OR

Q.5	(a)	Write a short note on Vibratory screen.	03
	(b)	What do you understand by rheological properties? With the help of graph explain Gumminess, Adhesiveness, Cohesiveness.	04
	(c)	Discuss different types of pores with diagram. Also explain True, Material and Particle density.	07

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