B.Tech Odd Semester (CBCS) Exam., December—2018

AGRICULTURAL ENGINEERING

(5th Semester)

Course No. : AECC–23

(Mechanical Operations in Food Processing)

Full Marks : 50
Pass Marks : 15

Time : 2 hours

Note : 1. Answer *any* **five** questions.

2. Begin each answer in a new page.

3. Answer parts of a question at a place.

4. Assume reasonable data wherever required.

5. The figures in the margin indicate full marks for the questions.

1. *(a)* A screw conveyor mounted on a 4 cm diameter shaft has screw pitch and diameter both equal to 30 cm. Estimate its actual capacity of conveying wheat weighing 850 kg/m^3 while operating at 150 r.p.m. Assume actual capacity as 50% of theoretical capacity. Also determine the HP requirement of motor for screw length of 8 m if the HP material factor for wheat is 0·4. 5

(b) Differentiate between ideal screen and actual screen. 5

2. *(a)* A belt conveyor of 50 cm width and pulley radius of 12 cm, rotating at 200 r.p.m. was used for the conveying of food grains. The angle of repose and density of the grain were 30° and 1200 kg/m^3, respectively. Determine the capacity of the belt conveyor. 5

(b) Describe in brief single- and double-screw extruder. 5

3. *(a)* What are the purposes of agitation and mixing of food materials? 5

(b) Describe the construction and working of disc bowl centrifuge with a neat figure. 5

4. *(a)* A flat belt conveyor of 1·0 m width is being used to convey paddy at a velocity of 2·5 m/s to a distance of 1000 m with an inclination angle of 10°. Using the following information, calculate the capacity of the belt conveyor : 5

Bulk density of paddy 550 kg / m^3

Angle of repose of paddy 36

K factor for 10° inclination 0 95

(b) Define terminal velocity. Discuss the applications of terminal velocity in food processing. 5

5. *(a)* Describe the working principle of bucket elevator with the help of a neat figure. 5

(b) Discuss the selection and purpose of filter aid and filter media. 5

6. *(a)* A screw conveyor of 20 tonne/hour capacity is required in pulse milling industry for transportation of pigeon pea grains to a horizontal distance of 16·5 m. If the screw speed is limited to 30 r.p.m., determine the screw diameter and horsepower requirement of an electric motor. 5

(b) What are the various engineering properties of food materials? Discuss any one of them in detail. 5

7. *(a)* What are the different types of filtration equipment? Explain any one of them with the help of a neat figure. 5

(b) Discuss in brief the working mechanism of pneumatic conveyor. 5

8. With the help of figure, explain the following terms related to texture profile analysis of food material : 10

(a) Hardness

(b) Fracturability

(c) Cohesiveness

(d) Springiness

(e) Gumminess

(f) Chewiness

(g) Resilience

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