

**Agricultural and Food Engineering Department
Indian Institute of Technology Kharagpur**

Spring End Semester Examination 2017 - 18

Subject: AG60124 Food Handling & Packaging

Date of examination: 19-04-2018 AN

No. of Students: 23

Full Marks: 50

Time: 3 Hrs

Note : Attempt all questions

1. a) A bucket elevator designed for lifting of wheat grain, in which each bucket is 30 cm long and the cross section is a portion of circle having radius of 18 cm and subtending an angle of 75° at the centre. The buckets are spaced 24 cm apart and the lift is 16 m from bottom. The head pulley diameter is 40 cm. The filling factor is given as 1.2. Calculate (i) belt speed for centrifugal discharge (ii) capacity of the lifting wheat weighing 675 kg m^{-3} and (iii) HP required assuming an overall efficiency of 80%. [6]
b) If the same elevator is used for parboiled paddy with bulk density of 750 kg m^{-3} , to load an LSU dryer at a height of 25 m, what will be the change in elevator capacity and power requirement?. Assume there is no change in belt speed and bucket filling. [4]
- 2 a) Enumerate the main problems identified in post harvest handling of fruits [3]
b) Write short notes on packing, storage and transport of fruits. [4]
c) Classify pneumatic conveying system based on their functionality. What are the limitations of pneumatic conveying? [3]
- 3 a) In a pneumatic conveyor granulated material with bulk density of 575 kg m^{-3} is being conveyed with air having density of 1.19 kg m^{-3} and air velocity is 28 m s^{-1} . The required mass flow rate is 4500 kg h^{-1} . The length of conveying is 48 m with four no of bends in the entire section. If the solid loading ratio is 2.5 and frictional factor (4f) is 0.05, calculate (i) the diameter of the transporting section pipe ii) blower capacity required iii) design blower power with a suitable safety factor iv) velocity of material being transferred. [6]
b) Explain dense phase vacuum conveying system with the help of a suitable diagram. [4]
- 4 a) Calculate the theoretical and actual capacity of a horizontal screw conveyor system for soaked soybeans (bulk density 840 kg m^{-3}) with the following specifications.
Screw diameter (D) = 30 cm
Shaft diameter (d) = 6 cm
Screw pitch (P) = 25 cm
Screw rotational speed (N) = 120 rpm
Filling coefficient = 0.4
Also calculate, what is the power requirement in the above operation? [5]
b) Design a belt conveyor for carrying 16 tonnes/h of granular material having bulk density 625 kg m^{-3} and angle of repose of 45° to a horizontal distance of 30 m. The width of the belt selected is 0.5 m. Calculate the power i) for horizontal conveying ii) for an elevated transportation upto 1 m height, but same distance. Given $A = 0.3$ and $B = 0.00187$ [5]
5. Write short notes on followings – [2 x 5 = 10]
 - a. Environmental stress cracking
 - b. Spoilage of canned foods
 - c. Collapsible aluminum tubes
 - d. Manufacture of 3-piece cans and its nomenclature
 - e. Compression molding