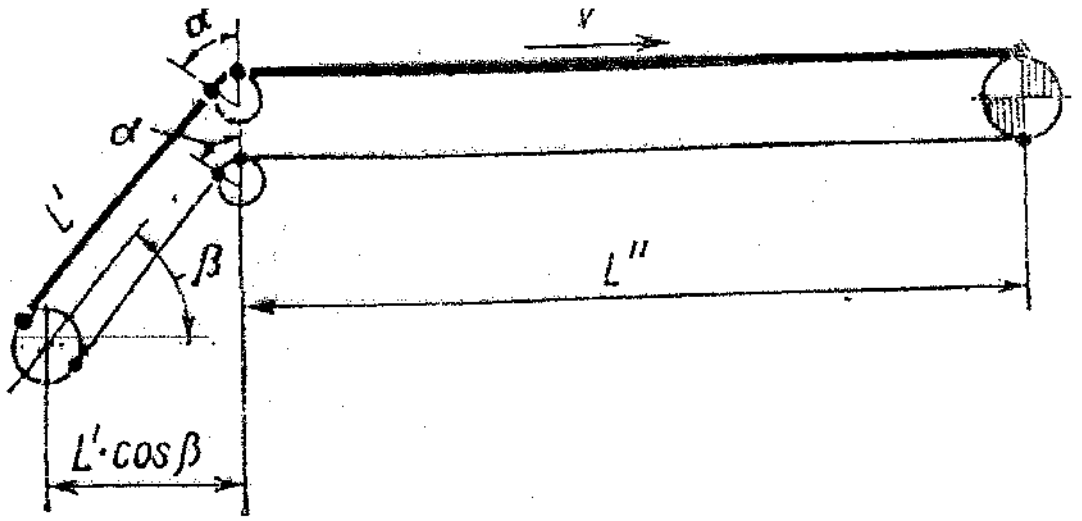
AGRICULTURAL & FOOD ENGINEERING DEPARTMENT
INDIAN INSTITUTE OF TECHNOLOGY
KHARAGPUR

Mid Spring Semester 2009-2010
Date of Examination .....27.02. 2010 (AN) Full Marks: 30 Time: 2h

M.Tech (PHE, DFE, ASM, MT), DD (DFE: 4th & 5th yr), BTech (4th yr), MS, PhD
Subject No. AG60124 Subject Name: Food handling and Packaging
No. of Students : 43 + 1 (RS)+1(MS)

(Answer the following)

Q1. The figure below shows the contour of a belt conveyer. Calculate the amount of tension developed on the tractive element in increasing order. Indicate the respective position on the diagram. [4]



Q2.

a) Suggest suitable conveying devices for the following food processing operations involving carrying of:

[½ x 4 =2]

(i) Carcass in poultry processing unit
(ii) Potato chips from production to packaging site
(iii) Biscuits in a baking oven
(iv) Spice powder to feed in filling machine.

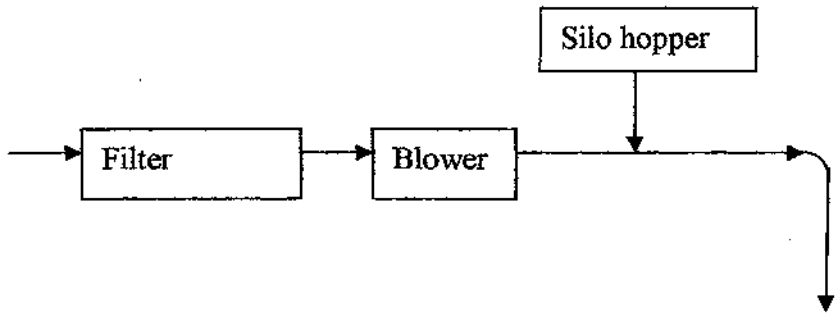
b) Distinguish between rated throughput capacity and actual throughput capacity? Discuss the controlling factors for each of them. What is the rated throughput capacity in ton/hour of a machine carrying 50 kg mass/m moving with a speed of 3 m/s?

[1+1+2 = 4]

Q3.

a) On the back ground of air:solid ratio, indicate different phases of pneumatic transport system. A part of a pressure pneumatic system emptying a silo consists of single piece of

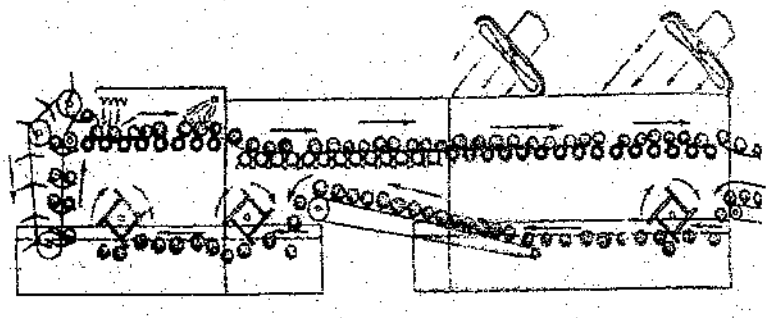
both horizontal and vertical pipe line as shown in the figure. Indicate the possible sources of pressure drop in the system. [1+1=2]



b) Wheat is carried at the rate of 3 kg/s through a 10 cm diameter pipe in a pneumatic transport system at a velocity of 30 m/s. Calculate the power (kW) required to convey it through a 90° elbow connected in the line. Consider a friction factor of 0.5. [2]

Q4.

a) The following figure shows the cleaning operations in a fruit processing plant. Discuss different types conveying devices used in this system. [1½]



b) You need to carry small lumpy material using a belt conveyer. Schematically show the upper and lower roller supports. [1]

c) Mention any three desirable characteristics of rubber-fabric conveyer belt. Schematically show the running-on, running-off, and wrapping angle of a belt-pulley system. Calculate the pull factor for belt having the angle of wrap of 200° and coefficient of friction of 0.15. [1½ x 3 = 4½]

d) Calculate the capacity of a drive motor if the total pull of a belt conveying system running at 5 m/s is 100 kN. [2]

Q5.

a) Discuss the different forces acting on the bucket in a bucket elevator. Define pole in a bucket elevator and indicate how pole distance is related to rpm of the drive pulley. [1x3 = 3]

b) A two start screw with a pitch of 2 cm and having diameter of 40 cm rotates at a speed of 200 rpm to convey a material of bulk density 600 kg/m^3 in horizontal direction. Calculate the throughput capacity in ton/h. Also calculate the horse power required for this machine to convey the material through a distance of 2 m. [2+2 = 4]
Assume, Coefficient of filling as 0.4 and Material factor as 0.4