Agricultural and Biosystems Engr. Dept.
Iowa State University

4/18/01
CJB

AE 469/569 - Exam 2

Part 1 Closed Book
Multiple Choice: 2 pts each

Name _____

1. Multiple Choice: 2 pts each Corn above the critical moisture content
   a) dries at a rate which cannot be predicted.
   b) dries so fast that kernel damage is probable.
   c) will not dry very well because a large portion of the water is bound.
   d) dries at a rate independent of kernel moisture content.

2. At a critical speed, a kernel in a vertical auger
   a) is not moving.
   b) is moving in a circular path.
   c) is moving in a spiral up.
   d) is moving in a spiral down.

3. This will decrease the critical speed of a vertical screw conveyor:
   a) roughen helix, smooth the tube.
   b) smooth the helix, roughen tube.
   c) roughen helix, roughen tube.
   d) smooth helix, smooth tube.

4. Auger damage to corn being conveyed is least when
   a) auger is operating nearly empty.
   b) auger is operating about half full.
   c) auger is operating at full capacity.
   d) a, b, or c, depending on auger speed.

5. During conveyance, material on a belt conveyor forms this angle with the horizontal:
   a) the dynamic angle of repose (DAR).
   b) DAR + 5 to 20 degrees.
   c) DAR - 5 to 20 degrees.

6. A bucket conveyor with c/w > 1 will begin to discharge
   a) before buckets reach top.
   b) after buckets reach top.
   c) when buckets reach top.
   d) can't say--depends on belt speed
   e) can't say--depends on head pulley size

7. What is the greatest problem associated with the use of bucket conveyers at grain elevators?
   a) power requirement
   b) investment cost
   c) reliability
   d) grain breakage

8. Power required for a perfect conveyor is dependent on:
   a) slope
   b) change in elevation
   c) horizontal conveyance distance
   d) drive efficiency
   e) b and c

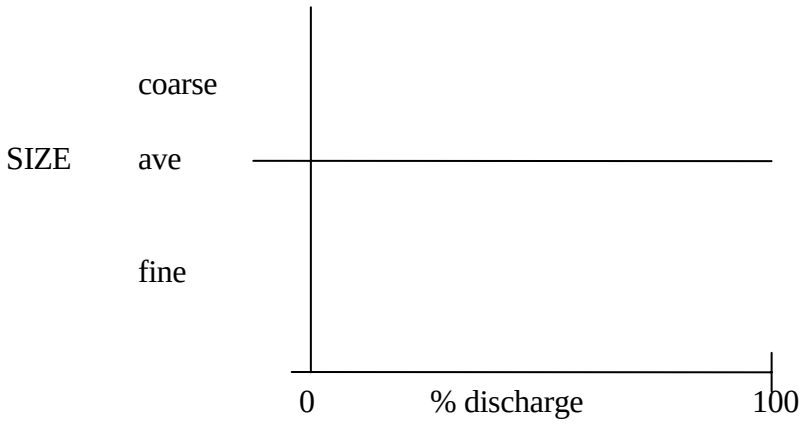
9. Maximum permissible slope for an en masse conveyor is
   a) 5 degrees
   b) 10 degrees
   c) 30 degrees
   d) 45 degrees
   e) 60 degrees
   f) 90 degrees

10. When compared to dry shelled corn, an auger conveying wet shelled corn will:
   a) have greater capacity and lower poser requirement
   b) have greater capacity and higher power requirement
   c) have lower capacity and lower power requirement
   d) have lower capacity and higher power requirement
   e) none of the above

11. For which method is power not dependent on coefficient of friction?
   a) belt
   b) flight
   c) screw
   d) en-masse

12. (6) Perfectly mixed granular material is loaded from a single spout into a hopper-bottom bin. The material is unloaded from the bottom center of the bin.

Show the shape of the discharge graph by drawing a line:



Part 2 Open Book & notes 4/8/01
Show your work CJB

Name _____

(24) 13. A 6-in screw conveyor is needed to convey dry shelled corn 45 ft at an angle of 45 degrees, and at a rate of 1400 bu/hour. (Refer to performance data tables for operating characteristics. Assume 18 in. intake exposure and one speed reduction. Assume standard pitch conveyor.)

a) What speed should the conveyor operate at?

b) What motor hp is required

c) At what % of theoretical capacity is the conveyor operating?

d) At what % of critical speed is the conveyor operating?

14. (14) You have been appointed as the engineer in charge of developing a 600-bu/hour continuous-flow, cross-flow grain dryer for the US market. Your boss has reviewed your design submitted for problem 8.12. With this design as a starting point, describe your plan to put a dryer on the market. Your boss has whatever resources are needed, if you can convince him/her to use them.

15. (24) Discuss belt, flight, bucket, and screw conveyors for grain. Consider good and bad points, and where each is most applicable and least applicable.