

KERALA AGRICULTURAL UNIVERSITY

B.Tech (Agri.Engg) 2012 Admission

Vth Semester Final Examination- January -2015

Cat. No: Fpme.3112

Marks: 80

Title: Farm Machinery and Equipment –II (2+1)

Time: 3 hours

- I. Fill up the blanks (10x1 = 10)
1. Cutting takes place when a system of forces act upon the material in such a manner to cause fail in _____.
 2. Hand type of paddy threshers usually employs _____ type of threshing cylinders.
 3. In a thresher the percentage of clean grain in the total grain obtained at the main outlet is called _____.
 4. In brush cutter, cutting is achieved by _____ force.
 5. In designing the slope of a surface for separating kernels and broken shells in a decorticating assembly, the physical property to be considered is _____.
 6. Harvesting method which do not necessarily involve direct contact of removal device with the fruit or stem are often referred as _____.
 7. Moistening of spindles in cotton pickers is done for _____.
 8. The distance between the corresponding points on a knife section of a cutter bar assembly, when at extreme left and at extreme right is called _____.
 9. of removing unwanted materials from threshed grains, using high velocity air is called _____.
 10. Use of harvesting clutches in vertical conveyor reaper is _____.
- II. Write short notes on ANY TEN (10x3 = 30)
1. A trailed type mower has drive wheel of 65 cm. The crank of the mower makes 850 rpm when it is hitched to a tractor moving at a constant speed of 3 kmph. If the speed ratio between the crank wheel and land wheel is changed to 30:1, calculate the increase in speed mower so as to maintain same speed of the crank.
 2. Differentiate flail shredders and rotary cutters used for plant cutting.
 3. Enumerate different methods used for mechanical shaking of trees for harvesting fruits. How is separation of fruit achieved in mechanical tree shakers?
 4. Write a note on maize sheller
 5. How the mowers are attached to tractors
 6. List out important horticultural tools and gadgets
 7. What are the functional units of a mechanical cotton picker

6. Enumerate the fixed and variable costs involved in analyzing the cost economics of a combine harvester.
7. What are advantages and disadvantages in using mechanical harvesters for harvesting tea?
 10. What are the basic functions to be carried out by a typical root crop harvester?
 11. What do you mean by the terms registration and alignment in mowers? Why are they important?
12. A 4 m width of cut combine is travelling at 50 m/min speed. In one minute time 50 kg of grain was caught in the grain tank and 60 kg of material was discharged at the rear of the machine. Calculate Field capacity, Material capacity and Through-put capacity.

III. Write short essays on ANY SIX

(6x5 = 30)

1. A vertical conveyor reaper is to be used for harvesting wheat crop at a height of 30 mm above the ground. The ultimate tensile strength and diameter of the crop stem are 35 N and 3 mm respectively. The friction coefficient of knife edge for wheat crop is 0.346 and the maximum oblique angle of the counter shear is 17° . The crop stem is homogenous solid with a uniform circular section. Calculate (a) The horizontal force in N that would cause bending failure of the crop stem. (b) What should be the maximum clip angle in degrees between knife and counter shear?
2. What are the common types of threshing cylinders used in grain threshers?
3. With the help of a neat sketch, discuss the common arrangements deployed in inertia shakers for harvesting tree crops.
4. Discuss various types of losses and standard procedure for estimating it, pertaining to harvesting of grain crops by combine harvesters.
5. Draw the cross-sectional view of a typical cutter bar with knife guard and discuss the need and necessity of having knife guard and wearing plate.
6. What is break even analysis? How can it be used in selecting the better option in terms of selecting different options for mechanical harvesting of paddy?
7. In harvesting grain with a 4.5 m self-propelled combine harvester, the time required for emptying the grain tank is 10 minutes per ha. Turning, adjusting and other interruptions account to 15% of effective operating time. The average width of cut 25 cm less than the rated width and the forward speed is 4.2 kmph. Calculate Field Efficiency and Effective field capacity. What will be the field efficiency if the grain tank is unloaded on-the-go with no time loss?
8. Discuss various losses associated with harvesting paddy by combine harvesters. Explain the standard procedure for estimating it in the field.

IV. Write essay on ANY ONE

(1x10 = 10)

1. A) With the help of a neat sketch, describe the procedure to draw the locus of absolute velocity of points on a knife of a cutter bar assembly of mowers

11) A farmer wishes to start a service enterprise for black pepper threshing. He has purchased a pepper thresher of capacity 300 kg/h for Rs 42,000. The unit consumes 2 units of electricity per hour and requires two operators one skilled and one unskilled. Experiences have indicated that 95 MT of black pepper will have to be threshed by the unit. Estimate the charges he should collect per kg of threshed black pepper, if he expects a profit of 30%. Assume Life of unit as 8 Years, Spike- Grain ratio as 1:0.5. Cost of electricity as Rs 10 per unit, Labour charges for skilled and unskilled as Rs 80 and Rs 40 respectively. The repair and maintenance cost is estimated as Rs 200 per year, and for housing of the unit an annual expense of Rs 1500 is incurred.

A) With the help of a neat line diagram, explain the power transmission system in power operated grain thresher.

B) A paddy combine harvester of cutter bar length 2.0 m is to be operated in a field, where the expected yield (grain) is 800 kg per ha and the grain straw ratio is 70:30. The optimal through put capacity of the threshing unit in the combine is 750 (crop) kg per hour. The grain tank capacity of the combine is 0.8 m^3 . Calculate the following. (Assume bulk density of paddy as 600 kg/ m^3 .)

- Speed of operation of combine in kmph so as to utilize the optimum capacity of the thresher.
- Theoretical field capacity of the combine.
- Actual field capacity while operating in a field of square shape and an area 1 ha, if for every turning 45 seconds and every unloading of the grain 1 minute is lost and the effective cutting width is only 90%.
- Recommend change in grain tank capacity, if unloading has to be done only after completing harvesting of 1 ha.