

UNIVERSITY OF RUHUNA
FIST EXAMINATION IN B.Sc. AGRICULTURAL RESOURCE MANAGEMENT & TECHNOLOGY and FIST EXAMINATION IN B.Sc. IN AGRIBUSINESS MANAGEMENT
NOVEMBER 2022

Agricultural Machinery Engineering (EN12201)

Time 1 1/2hrs

Structured and Essay Type

Index No: _____

Give answer to questions of Part A (question 2) in the space provided.
 Use the given answer book to answer the three questions of Part B.
 Only non-programmable calculators are permitted.
 All questions carry equal marks.

Part A

Answer all questions.

1. (a). The structural views of six pump types are given below in figure: 01. (Marks 12)

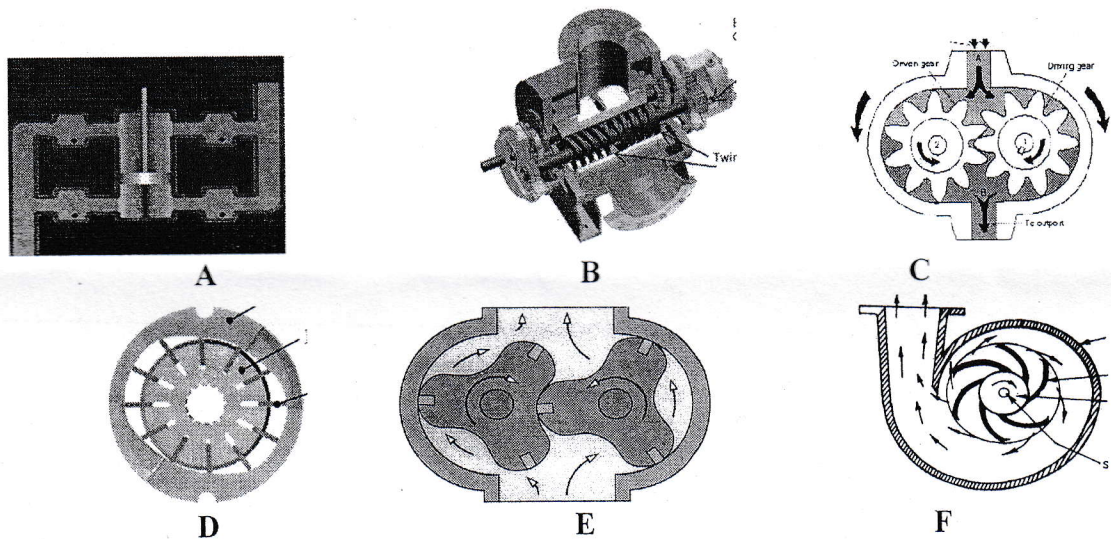
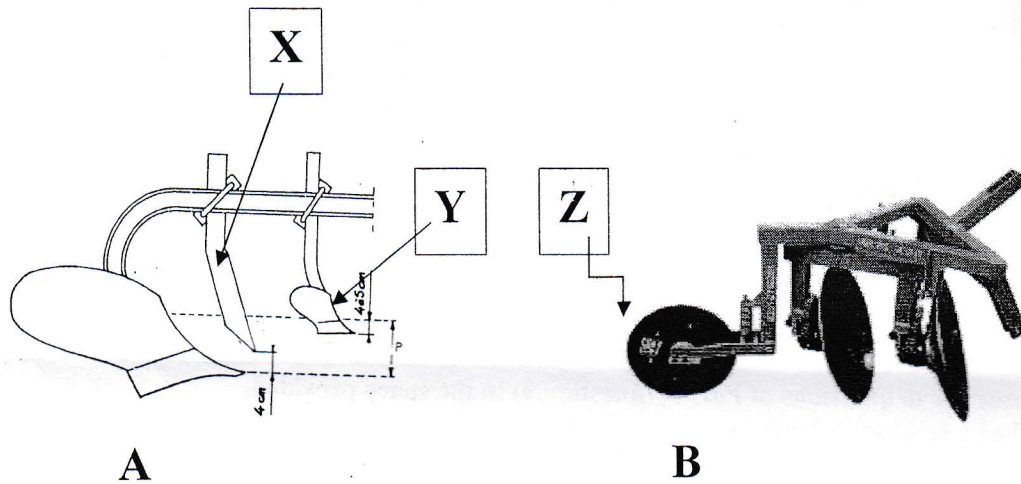


Figure. 01;
 Identify the above pumps and write the main category of pumps according to their classifications

	Name	Main category of pump
A		
B		
C		
D		
E		
F		



Figure,02;

(b) (i). Identify X, Y and Z, in figure: 02

(08 marks)

(X).

(Y).

(Z).

(ii). What are the main functions of component - Z ‘?

.....

(c) (i). Identify and write down the names and main functions of the parts relevant to each number in figure 03. (30 marks)

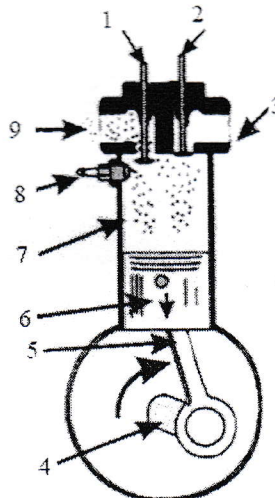


Figure 03;

	Moving parts	Functions	Structural parts (stationary parts)	Functions
1				
2				
3				
4				
5				
6				
7				
8				
9				

(ii). Briefly explain the purpose of structural parts (stationary parts) of the engine?

02. (a) The experimental set up for estimating the Center of gravity of a tractor is given in figure-04. (16 marks)

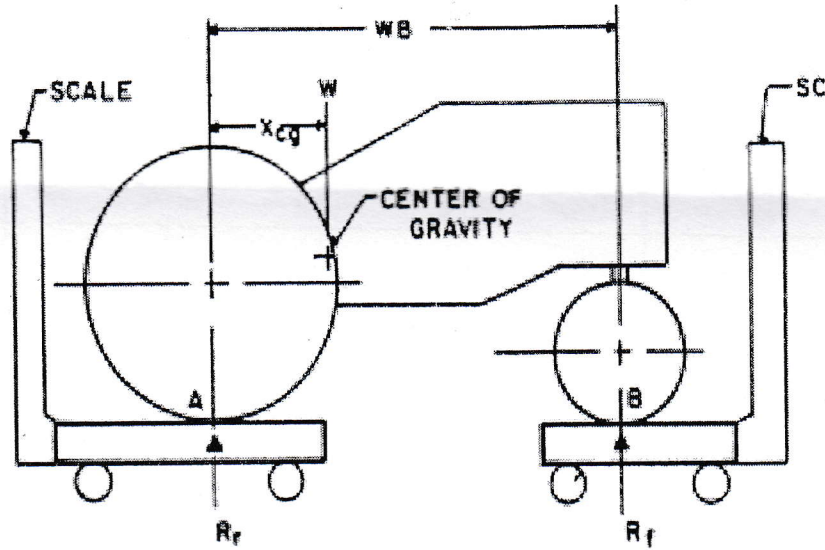


Figure 04

- (i) Derive an equation to measure the X_{cg} of a tractor given in figure 4.

- (ii) A four wheel drive tractor with a total weight of 43.5 kg has 2100 mm wheel base. Its four wheels are similar in size. Calculate the horizontal distance from the rear axel center line to the Centre of gravity. (State your assumptions.)

(b) A diagram of a direct shear box arrangement is given in figure 05. (10 marks)

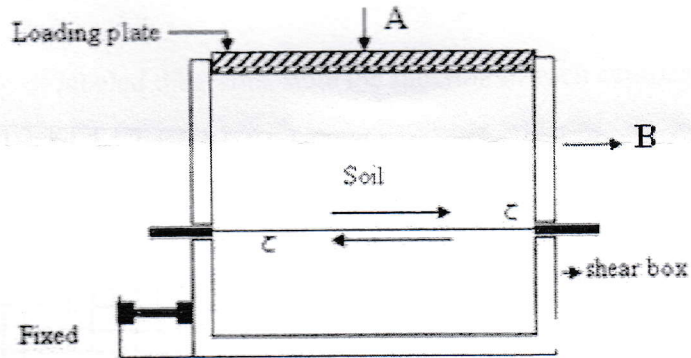


Figure 05

(i) What are the soil parameters measured using above apparatus?

.....

.....

(ii) Identify the type of force applied on A & B.

A.....

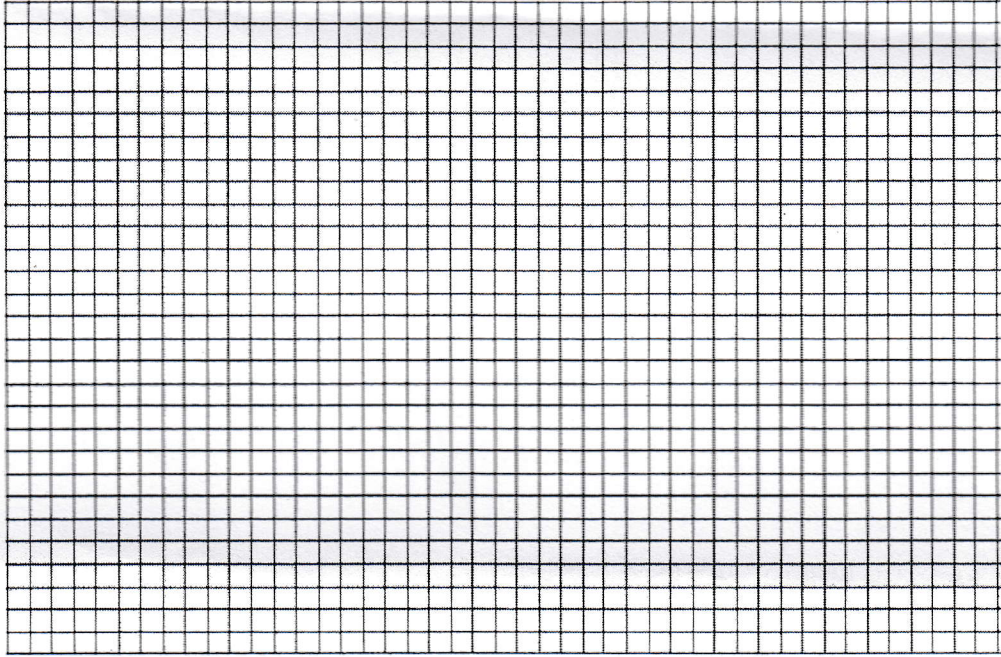
B.....

(c) (i) The test results of the above apparatus are given in following table. If the cross-sectional area of the shear box is 3600 mm^2 . Calculate the stress values of the given force.

(24 marks)

Value A (kN)	Stress of force A (kPa)	Value B (kN)	Stress of force B (kPa)
0.2		46	
0.4		63	
0.8		101	

(ii). Draw a graph using the above data to determine the soil parameters in the given graph paper.



(iii). Determine the soil parameters.

Part B

Answer only two questions

- 1 (a) With the help of labeled diagrams, state the function of each component of following instruments;
- (a) Disk harrow
 - (b) Disk Plough
 - (c) Mouldboard plough
 - (d) Subsoil plough
- (40 marks)**
- (b). Classify the commonly used water pumps. **(20marks)**
- (c) What is a single and double action piston pump? **(20 marks)**
- (d). Piston radius and stroke of a single action piston pump are 15cm and 30cm respectively. If the piston operates 100 strokes per minute, calculate the discharge capacity of the pump in L/h. **(20 marks)**
- 2 (a). Enlist the main types of gears that can be used in a power transmission system. **(30 marks)**
- (b). Estimate the Indicated power of six-cylinder four-stroke gasoline engine run at 2500 rpm. Its cylinder bore, stroke and indicated mean effective pressure (IMEP) values are 90 mm, 100 mm and 8.5 bar respectively. **(30 marks)**
- (c). A single-cylinder engine operating at 2000 rpm develops a torque of 8 N-m. The indicated power of the engine is 2.0 kW. Find loss due to friction as the percentage of brake power. **(40 marks)**
- 03** (a) Briefly explain;
- (i). Mechanical properties of the soil which are involved in tillage mechanics.
 - (ii). Changing pattern of 'Apparent coefficient of friction' with increasing moisture content using the sketch of graph. **(20 marks)**
- (b) (i) What do you understand the term "*Appropriate Mechanization*"? **(10 marks)**
- (ii) Briefly describe the different factors considered in *Appropriate Mechanization*. **(30 marks)**
- (c). (i) What is the importance of agricultural machinery management? **(10 marks)**
- (ii) How can you measure the machine capacity? **(10 marks)**
- (iii) Calculate the field efficiency of a tractor which drawn four bottoms of 35cm plough. The operational speed of the plough is 5 kmph and the time lost in turning is 10%. **(20 marks)**
- (Make your assumptions).