Requirements for this paper:					
Multiple-choice cards:		**Non-programmable calculator:**	X	**Open book examination:**	
Grid paper:		**Laptop:**			

EXAMINATION:	SUPPLEMENTARY EXAM	**PROGRAMME:**	Dip .
MODULE CODE:	NAGE51214	**DURATION:**	3 HOURS
MODULE DESCRIPTION:	AGRICULTURAL ENGINEERING	**MARKS:**	100
EXAMINER(S):	MAXWELL CHIMBUNDE	**DATE:**	
MODERATOR(S):	PROF AHMED MOHAMED	**TIME:**	

INSTRUCTIONS:

- Answer ALL questions.
- Show all calculations and working.

QUESTION 1

(I)EXPLAIN THE IMPORTANCE OF TRACTOR HORSEPOWER (HP/ KW) IN SELECTION OF A TRACTOR FOR A FARM ACTIVITY.

5 MARKS

(II) DISCUSS THE SAFETY CONSIDERATIONS THAT MUST BE CONSIDERED WHEN OPERATING A TRACTOR.

5 MARKS

(III) DISCUSS THE ECONOMIC FACTORS THAT INFLUENCE THE PURCHASE OF A TRACTOR ON A FARM.

5 MARKS

(IV)HOW CAN SMALLHOLDER FARMERS BE INTERGRATED INTO THE BROADER AGRICULTURAL MECHANISATION STRATEGY

5 MARKS

(20 MARKS)

QUESTION 2

(I)IN A PULLEY SYSTEM WITH 5 SUPPORTING ROPES AND A LOAD OF 500KG, WHAT IS THE TENSION IN EACH ROPE? (g=9.81m/s)

2 MARKS

(II)A BELT DRIVEN PULLEY SYSTEM HAS A DRIVER PULLEY WITH A DIAMETER OF 150MM AND A DRIVEN PULLEY WITH 450MM DIAMETER. IF THE DRIVER PULLEY ROTATES 1200RPM, CALCULATE THE ROTATIONAL SPEED OF THE DRIVEN PULLEY.

3 MARKS

(III)IN A PULLEY SYSTEM, THE DRIVER PULLEY ROTATES AT 1800RPM AND HAS A DIAMETER OF 200MM. THE DRIVEN PULLEY ROTATES AT 600RPM. CALCULATE THE DIAMETER OF THE DRIVEN PULLEY.

2 MARKS

(IV)IF THE DIAMETER OF A DRIVER PULLEY IS 300MM AND IT ROTATES AT 1000RPM, CALCULATE THE LINEAR SPEED OF THE BELT IN M/MIN

3 MARKS

(V) A PULLEY SYSTEM HAS A DRIVER PULLEY WITH A DIAMETER OF 250MM, ROTATING AT 1500RPM, AND A DRIVEN PULLEY OF 500MM DIAMETER. IF THE BELT TENSION IS 200N AND THE COEFFICIENT OF FRICTION BETWEEN THE BELT AND THE PULLEY IS 0.3, CALCULATE THE POWER TRANSMITTED BY THE BELT.

POWER = F*v

$P = (T1-T2)* v$

T1 =TENSION ON THE TIGHT SIDE (200N)

T2= TENSION ON THE LOOSE SIDE ($T1 *\exp(-\mu*\Theta)$)

Where μ= coefficient of friction = 0.3

AND $\Theta = 180^0 = \pi$ RADIANS

V=BELT SPEED

10 MARKS

(20 MARKS)

QUESTION 3

(i)WHAT IS THE PURPOSE OF A BILL OF QUANTITIES IN FARM BUILDING CONSTRUCTION?

5 MARKS

(ii)WHAT ARE THE MAIN COMPONENTS OF A BILL OF QUANTITIES (BOQ)?

5 MARKS

(iii) IF A FARM BUILDING REQUIRES A CONCRETE FOUNDATION SLAB WITH THE FOLLOWING DIMENSIONS 10M BY 15M AND A THICKNESS OF 200MM, CALCULATE THE VOLUME OF CONCRETE REQUIRED.

2 MARKS

(iv)A FARM BUILDING REQUIRES A BRICK WALL THAT IS 40M LONG AND 3M HIGH AND 0.3M THICK.CALCULATE THE NUMBER OF BRICKS REQUIRED IF EACH BRICK HAS THE FOLLOWING DIMENSIONS 0.25M*0.12M* 0.08 M.

3 MARKS

(v) IF LABOUR COSTS R0.50 / BRICK CALCULATE THE TOTAL LABOUR COST TO CONSTRUCT THE WALL

2 MARKS

(vi) IF THE WASTAGE OF CONCRETE IS ESTIMATED AT 5% HOW MUCH MORE CONCRETE SHOULD BE BOUGHT?

3 MARKS

(20 MARKS)

QUESTION 4

(I) LIST AND EXPLAIN THE STEPS IN DESIGNING AN IRRIGATION SYSTEM?

10 MARKS

(IV) CALCULATE THE REQUIRED CAPACITY OF AN IRRIGATION PUMP IF THE TOTAL AREA TO BE IRRIGATED IS 5HA, AND THE WATER REQUIREMENT IS 6MM/ DAY? ASSUME IRRIGATION IS DONE 8HOURS A DAY

6 MARKS

(V)DESCRIBE TWO IRRIGATION SCHEDULING TECHNIQUES AND THEIR BENEFITS.

4 MARKS

(20 MARKS)

QUESTION 5

(I)WHAT IS THE PRIMARY FUNCTION OF SECONDARY TILLAGE EQUIPMENT?

5 MARKS

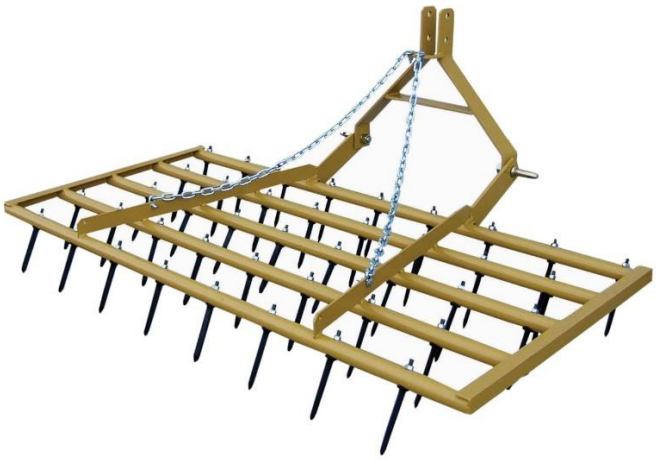
(II)NAME AND DESCRIBE TWO COMMON TYPES OF SECONDARY TILLAGE EQUIPMENT.

4 MARKS

(III) WHAT ROLE DO ROLLERS PLAY IN SECONDARY TILLAGE OPERATIONS?

3 MARKS

(IV)NAME THE IMPLEMENT IN THE PICTURE?



2 MARKS

(V) DRAW AND LABEL A TRACTOR-DRAWN DISC PLOUGH?

6 MARKS

(20 MARKS)
