FACULTY OF NATURAL RESOURCES AND SPATIAL SCIENCES

DEPARTMENT OF NATURAL RESOURCES AND AGRICULTURAL SCIENCES

QUALIFICATION: BACHELOR OF AGRICULTURE
QUALIFICATION CODE: 07BAGR
LEVEL: 5

COURSE CODE: AMC520S
COURSE NAME: AGRICULTURAL MECHANISATION

SESSION: 9 June 2016 at 13:00
PAPER: THEORY

DURATION: 3 (THREE) hours
MARKS: 150

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER

EXAMINER(S) Mr C. Els

MODERATOR: Mr W. F. Adank

INSTRUCTIONS

1. Answer ALL the questions.
2. Write clearly and neatly.

PERMISSIBLE MATERIALS

1.
2.
3.

THIS QUESTION PAPER CONSISTS OF 6 PAGES (Including this front page)
SECTION A: WELDING

Question 1:
What are the two aspects needed for a proper weld once the thickness of a mild steel workpiece has been determined? (2)

Question 2:
Certain types of butt welds are limited as far as thickness of metal pieces is concern. What are the workpiece thickness limitations for a:

a) Square butt weld
b) Double vee butt weld
c) Single u butt weld
d) Single vee weld (4)

Question 3:
Name six (6) characteristics, typical of vertical welding, using the downward technique. (6)

Question 4:
Name four (4) results of using too low amperes/current. (4)

Question 5:
Name five (5) causes of undercut. (5)

Sub Total: [21]

SECTION B: SAFETY

Question 1:
Briefly discuss the purpose of an earth leakage relay? (3)

Question 2:
Name five (5) safety aspects you must attend to when working with a bench grinder. (5)

Question 3:
Name six (6) safety precautions to take in mind when working with a gas blow torch. (6)

Question 4:
Name four requirements of a properly soldered joint. (4)

Question 5:
Name the joint and describe the method you are to follow in joining solid overhead conductors. (6)

Sub Total: [24]
SECTION C: ALTERNATIVE ENERGY

Question 1:
Give one word for the following:

a) The amount of sunlight reaching an area
b) The amount of electricity produced by a solar generator at noon on a sunny day.
c) A measure of solar radiation as heat.
d) Any number of photovoltaic modules connected together electrically, with support structure to provide a single DC electrical output.
e) The unit of electrical potential difference across which a current flows. (5)

Question 2:
Explain the term “thermosiphoning” (1)

Question 3:
Explain the term “stratification” (1)

Question 4:
Name four (4) precautions that can be taken to prevent damages to your warm water solar system, during freezing conditions in the colder areas of the country. (4)

Question 5:
Name seven (7) aspects to attend to when buying a new solar warm water installation. (7)
Sub Total: [18]

SECTION D: CONCRETE

Question 1:
Name six (6) curing methods of concrete. (6)

Question 2:
Describe in detail the procedure to follow when fresh concrete is attached to concrete which is four months old. (7)

Question 3:
Name seven (7) aspects that influence the strength of concrete. (7)
Sub Total: [20]
SECTION E: THE MOTOR VEHICLE

Question 1:
What are the two components called, that are cast in one single metal unit, called the engine block? (2)

Question 2:
Name the two parts of the engine that:
   a) fits on top of the engine
   b) fits underneath the engine (2)

Question 3:
What is the purpose of the oil rings in an engine? (1)

Question 4:
What are the functions of the following parts in a motor vehicle?
   a) Venturi
   b) Water filler cap
   c) Bottom radiator hose
   d) Thermostat
   e) Fan
   f) Rocker arm
   g) Valve spring
   h) Breaker points
   i) Main discharged nozzle
   j) Rotor arm (10)

Question 5:
Describe how the drum brakes work. (7)

Question 6:
Describe in the correct sequence the power flow/ power train of a rear wheel driven, motor vehicle. (8)

Sub Total: [30]

SECTION F: FENCING

Question 1:
What is the purpose of a surveyor’s beacon? (1)

Question 2:
Name five reasons for fencing. (5)
Question 3:
Name the two main differences in appearance, between Campeon and IOWA barbed wire. (2)

Question 4:
Describe four ways to secure netting to the ground. (4)

Question 5:
What is the maximum distances allowed between the following?
   a) Posts on hard soil
   b) Standards on sandy soil
   c) Posts on sandy soil
   d) 2 x 4lb hammers

Sub Total: [15]

SECTION G: WATER PUMPS FOR ARTIFICIAL WATER POINTS

Question 1:
You found that after starting your water pump at one of your water points, the water supply is weak or non-existing, although the pump and the engine are functioning well.

Name eight (8) possible faults for which you should look. (8)

Question 2:
When pulling pipes, a collection of tools will be used.

What will the following tools be used for?
   a) Vastrap
   b) 2 x 750 mm pipe wrenches
   c) Zulu-shortgrip
   d) Wire brush
   e) 2 x 4lb hammers

Question 3:
Draw a sketch, pointing out (each with an arrow) the four connecting points, where the cable you use for pulling pipes will be connected, when you are making use of an existing windmill on top of the borehole and pulling takes place by means of a 4x4 vehicle. (4)

Question 4:
What is the minimum depth a black polyethylene water pipe should be buried under ground to protect it against porcupines? (1)
Question 5:

Name four possible causes when a water pump engine lacks power (no excessive smoke from the exhaust).  

(4)

Sub Total: [22]

TOTAL OF PAPER: [150]
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FIRST OPPORTUNITY MEMORANDUM
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THIS QUESTION PAPER CONSISTS OF 10 PAGES (Including this front page)
SECTION A: WELDING

Question 1:

- Amperes needed
- Size of electrode

(2)

Question 2:

a) Up to 6 mm
b) 12mm and over
c) Over 40mm
d) Up to 16mm

(4)

Question 3:

- Current use is medium
- Penetration is poor
- Fusion is poor
- Each run is small
  - concave
  - and smooth

(6)

Question 4:

- Difficulty in striking and holding the arc
- Electrode tends to stick to the work piece
- Penetration is poor
- Beads with a distinctly rounded profile will be deposited

(4)

Question 5:

- Too high current
- Arc too long
- Joint preparation does not allow correct electrode angle
- Electrode too large for joint
- Angle of electrode too inclined to joint face

(5)

Sub Total: [21]
SECTION B: SAFETY

Question 1:

- It is designed to automatically disconnect an installation or circuit
  - from the supply
  - in the event of a leakage current of 20 mA or more flowing to the earth. (3)

Question 2:

- Wheels have to be checked for cracks
  - chips
  - and tightness
- Guards/shields to be checked for tightness when grinding small or sharp objects.
- Do not use the side of the stone unless it is designed for such use. (5)

Question 3:

- Handle the gas cylinders with due care.
- Do not expose the gas cylinders to extreme heat.
- Only use approved gas hoses.
- Do not work with a blowtorch near the gas cylinder or other flammable materials.
- Always close the valve on the cylinder after use.
- Do regular inspections for leaks. (6)

Question 4:

- The solder must penetrate the whole joint and all spaces must be filled with solder.
- The resistance of the joint must not be higher than the rest of the conductor.
- It must be mechanically strong enough for its particular application.
- It must be neat. (4)

Question 5:

- The Britannia joint.
- The ends must be clean and tinned.
- The tips must be bent up at right angles and
  - overlapped for a distance of about 15 times the diameter of the conductor.
- Tinned copper wire is then bound around the conductors.
- The joint is then soldered. (6)

Sub Total: [24]
SECTION C: ALTERNATIVE ENERGY

Question 1:

a) Radiation  
 b) Peak watt  
 c) Langley  
 d) Array  
 e) Volt  

Question 2:

This is the replacement of heated water near the top of the storage tank, by cold water from the bottom of the tank in a circulation cycle.

Question 3:

It is the process of keeping the cold bottom and warm upper layers of water in the storage tank fairly distinct.

Question 4:

- The use of indirect systems, in which an anti-freeze agent is added to the closed circuit.  
- The use of systems in which expansion can be accommodated.  
- Draining the system if freezing conditions are expected.  
- Activating the circulation pump in forced systems by means of a thermostat when a low temperature occurs in the solar panel or a low outside temperature is experienced.

Question 5:

- It should absorb heat adequately.  
- It must be able to retain the absorbed heat.  
- It must keep the insulation dry.  
- It must be designed so it prevents corrosion.  
- It must be resistant to hail.  
- It must be frost resistant.  
- It must be economical.

Sub Total: [18]
SECTION D: CONCRETE

Question 1:

- Leaving the shuttering of pillars in place for a prolonged period of time.
- In case of horizontal surfaces a layer of water can be dammed up by making a little bank of sand around the edge of the surface.
- Concrete can also be covered with sand, straw, saw dust or wet sacks.
- Spray the surface with water regularly.
- Cover the surface with water proof polyethylene sheets.
- Making use of curing fluids.

Question 2:

- The surface of the old concrete has to be chipped away.
- It should then be scrubbed with a wire brush to reveal the rough material in the old concrete.
- Just before the new concrete is poured a thin layer of creamy cement paste is brushed over the old concrete.
- This paste is a mixture of cement powder and water only.
- A thin layer of mortar should follow this.
- The mortar should be mixed from cement and sand at the same ratio as that used for the existing concrete without taken the stone into account.
- The fresh concrete can now be placed before the mortar is completely dry.

Question 3:

- Cement : water ratio
- Age of normal concrete
- Age of cement
- Characteristics of the cement
- Temperature
- Curing
- Compacting

Sub Total: [20]
SECTION E: THE MOTOR VEHICLE

Question 1:
- Cylinder block
- Crankcase

Question 2:
  a) A rocker arm cover or a tappet cover
  b) Oil sump

Question 3:
It scrapes the oil down the cylinder walls, preventing the oil from getting into the combustion chamber.(1)

Question 4:
  a) Increases air speed
  b) Increase pressure to increase boiling point
  c) To transfer the cooled down coolant from the radiator to the engine
  d) Regulate the coolant flow
  e) Sucks air through the core of the radiator
  f) Push the valve into the chamber (to open the valve)
  g) To bring the valve back in position (to close the valve)
  h) To interrupt the flow of the 12 volt current (when opening), causing the coil to produce a current of more than 20000 volts
  i) To change the petrol (when entered the barrel) from a liquid into a vapor
  j) To transfer the 20000 volts plus from the nipple, on the inside at the center of the distributor cap, to the terminals around the inside of the distributor cap, on the way to the spark plugs (10)

Question 5:
- Stepping on the brake pedal
  - hydraulic force activates the wheel cylinder.
- The two pistons in the cylinder move outwards
  - forcing the brake shoes outward against the inner side of the wheel drum
  - slowing or stopping the rotating wheel.
Question 6:

- Flywheel
- Clutch
- Transmission
- Universal joints
- Propeller shaft
- Differential
- Rear axle
- Rear wheels

Sub Total: [30]
SECTION F: FENCING

Question 1:
It determines the boundaries of a registered property. (1)

Question 2:
- Improvement of grazing management
- Movement of livestock
- Predator control
- Disease control
- Breeding control (5)

Question 3:
- Campeon wire: barbs spaced at 127 mm intervals, versus IOWA: barbs spaced at 150 mm intervals
- Campeon: single strand, versus IOWA: double strand (2)

Question 4:
- At least 150 mm netting laid flat on the ground and held down with stones.
- At least 150 mm netting laid flat on the ground stapled to the ground, using staples 150 mm x 4mm.
- Netting should be dug vertically into the ground 150mm, no stone used.
- Netting dug vertically into the ground 100 mm, stones placed either side of netting, below ground level. (4)

Question 5:
- a) 20 m
- b) 15 m
- c) 18 m (3)

Sub Total: [15]
SECTION G: WATER PUMPS FOR ARTIFICIAL WATER POINTS

Question 1:

- Broken or loose rod
- Disconnected pipe
- Hole in pipe or some other fitting
- Cylinder piston leather washers worn or damaged
- Piston or piston valve faulty
- Foot valve faulty
- Pipes too long - cylinder in mud
- Water level in borehole dropped

Question 2:

a) To secure pipes on top of the borehole
b) To tighten and undo the lock nuts and rod sockets from and to the rods
c) To grip the pipe in order to pull
d) To clean the threads of pipes, pipe sockets and rods from dirt.
e) To hit the pipe sockets on opposite sides at the same time. in doing so, loosening the rust between the pipe and pipe sockets, to loosen it easier.

Question 3:
Question 4:

50 cm

Question 5:

- Speed control lever does not stay in position
- Air in the injection system
- Clogged fuel filter
- Injection nozzle carboned up

Sub Total: [22]

TOTAL OF PAPER: 150