Province of the
EASTERN CAPE
EDUCATION

NATIONAL
SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2017

MECHANICAL TECHNOLOGY
MARKING GUIDELINE

MARKS: 200

This marking guideline consists of 21 pages.

SECTION A: COMPULSORY

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

1.1	B	✓	(1)
1.2	D	✓	(1)
1.3	A	✓	(1)
1.4	D	✓	(1)
1.5	D	✓	(1)
1.6	A	✓	(1)
1.7	B	✓	(1)
1.8	A	✓	(1)
1.9	C	✓	(1)
1.10	D	✓	(1)
1.11	B	✓	(1)
1.12	B	✓	(1)
1.13	C	✓	(1)
1.14	D	✓	(1)
1.15	A	✓	(1)
1.16	B	✓	(1)
1.17	C	✓	(1)
1.18	B	✓	(1)
1.19	A	✓	(1)
1.20	C	✓	(1)

[20]

QUESTION 2: SAFETY

2.1
- Select the correct type of wheel for the job. ✓
- Inspect the wheel for cracks. ✓
- Check if it is not damaged. ✓
- Make sure the wheel's speed does not exceed the manufacturer's recommendations. ✓
- Check if the guards are in place.   (Any 4 x 1)   (4)

2.2
- Poor housekeeping ✓
- Loose clothing ✓
- Improper use of tools ✓
- Inaccurate set-up of machines ✓   (4)

2.3   It is used to rough - cut large sections of metal✓ before they are further machined or used in manufacturing.✓   (2)

2.4   2.4.1
- Every workplace must be ventilated either by natural or mechanical means so that the air breathed by employees is safe. ✓✓
- That the concentration therein of any explosive or flammable gas vapour or dust does not exceed safety levels.   (Any 2 x 1)   (2)

         2.4.2
- There must be adequate lighting in the work place. ✓✓
- The lighting on rotating machinery must not cause a flashing effect.
- Lights and lamps must be kept clean and maintained.   (Any 2 x 1)   (2)

2.5
- Store full cylinders apart from empty ones. ✓
- Keep cylinders in a cool place and protect them from sunlight and other sources of heat. ✓
- Always store and use cylinders in an upright position. ✓
- Store oxygen cylinders away from fuel cylinders. ✓
- Never stack cylinders on top of each other.
- Do not bang or work on cylinders. (Any 4 x 1) (4)

2.6
- Fixed guards ✓
- Automatic guards ✓
- Manual guards
- Self-adjusting guards (Any 2 x 1) (2)

2.7
- Choose the correct sharpened drill for the type of work you need to do and the material you are going to drill. ✓
- Do not leave the chuck key in the chuck when you are not at the machine. ✓
- Never leave the machine to run unattended. ✓
- Clamp the work piece securely to the table and do not hold it by hand. ✓
- Never try to stop the work piece by hand if it slips from the clamp.
- A drill should run at the correct speed for the job. (Any 4 x 1) (4)

[24]

QUESTION 3: TOOLS

3.1   3.1.1   Inside micrometer ✓   (1)

        3.1.2   **A**   Contact ✓
                 B   Thimble ✓
                 C   Barrel ✓
                 E   Rod lock ✓
                 F   Contact ✓   (5)

3.2   • It prevents bolts and studs from breaking. ✓
        • It prevents bolts or nuts from loosening. ✓
        • It prevents castings from warping. ✓   (3)

3.3   Surface grinder ✓   (1)

3.4   Sensitive drill press. ✓
        Upright drill press. ✓
        Radial drill press ✓   (3)

3.5   Clean after use. ✓
        Never force drill. ✓
        Oil machinery regularly. ✓
        Check rack on side of pillar column.
        Release the table lock before adjusting the table.   (Any 3 x 1)   (3)
                                                                                     [16]

QUESTION 4: MAINTENANCE

4.1
- Viscosity / Viscosity index ✓
- Flash point / oxidation resistant ✓
- Burning point / foam resistant ✓
- Pour point / cold point
- Adhesion / carbon resistant (Any 3 x 1) (3)

4.2
- Cost ✓
- Maintenance ✓
- Downtime ✓ (3)

4.3 To reduce friction ✓✓ (2)

4.4 A loss in efficiency ✓ and eventually mechanical failure ✓ (2)

[10]

QUESTION 5: MATERIALS

5.1
- To soften the metal ✓
- To make steel suitable for bending, drawing or cold work operations ✓ (2)

5.2 Steel articles to be case hardened need to have outer case converted from low carbon to that of a high carbon steel. ✓✓ (2)

5.3 **A** Charging ladle ✓
B Funnel ✓
C Scrap metal ✓
D Steel ✓
E Slag thimble ✓
F Charging machine ✓
G Charging boxes ✓ (6)

5.4
- Time ✓
- Temperature ✓ (2)

5.5
- Heat the temperature between 220 °C and 300 °C and quench. ✓
- The tempering colours which are oxides of iron, indicate a particular temperature. ✓
- Each temperature indicate a degree of hardness. ✓
- The higher the temperature, the softer the resulting metal. ✓
- Heating can be by means of direct heat from a Buisson or a sand burner. (Any 4 x 1) (4)

5.6 The different colour changes✓ during the heat treatment process. ✓ (2)

5.7
- **Hardening:** The process of heat treating steel ✓ to enable it to resist wear or cut other metals. ✓
- **Tempering:** This is a follow up process from hardening ✓ to relieve the strain induced during the hardening process and to reduce brittleness. ✓ (4)

5.8   5.8.1   C
         5.8.2   D
         5.8.3   A
         5.8.4   B   (4)

5.9
- Greater hardness ✓
- Higher tensile strength ✓
- More ductility ✓
- Reduced welding ability   (Any 3 x 1)   (3)

[30]

TOTAL SECTION A: 100

SECTION B: FITTING AND TURNING (SPECIFIC)

QUESTION 6: TERMINOLOGY

6.1 **Advantages of taper turning:**
- Set at any required angle. ✓
- Large tapers can be turned. ✓
- External and internal tapers can be turned.   (Any 2 x 1)(2)

   Disadvantages of taper turning:
- Can only move short distances. ✓
- Can only be done by hand turning. ✓
- Short distances mean accuracy is not good.   (Any 2 x 1)(2)   (4)

6.2
- Long tapers ✓
- Slow tapers under approximately 14° included angle ✓
- Short slow tapers ✓
- Short steep tapers ✓
- Combination of two or a number of the previous categories   (Any 4 x 1)   (4)

6.3   6.3.1   Calculate the distance across the flat side:
$\text{Sin } Ø = \frac{x}{90}$
$x = 90 \text{ Sin } Ø$ ✓
$x = 90 \text{ Sin } 45°$ ✓
$= 90 \times 0{,}707$ ✓
$= 63{,}64 \text{ mm}$ ✓
Depth of cut $= \frac{90-x}{2}$
$= \frac{90-63{,}4}{2}$ ✓
Depth of cut $= 13{,}18 \text{ mm}$ ✓   (6)

6.3.2   Calculate the distance across the flat side:
$\text{Sin } Ø = \frac{x}{90}$
$x = 90 \text{ Sin } Ø$ ✓
$= 90 \text{ Sin } 60°$ ✓
$= 77{,}94 \text{ mm}$ ✓
Depth of cut $= \frac{90-x}{2}$
$= \frac{90-63{,}4}{2}$ ✓
$= \frac{12{,}06}{2}$ ✓
$= 6{,}03 \text{ mm}$ ✓   (6)

6.4
- The British system of measurements ✓
- The metric system of measurement ✓   (2)

6.5   6.5.1   ASSY – Assembly ✓   (1)
       6.5.2   CHAM – Chamfered ✓   (1)
       6.5.3   DIA – Diameter ✓   (1)
                                                                        [25]

QUESTION 7: TOOLS AND EQUIPMENT

7.1   35 ✓ + 995 ✓ = 35,995 ✓   (3)

7.2   It provides a quick and accurate means of checking internal measurements. ✓✓ (2)

7.3   • To determine the run-out of a flywheel ✓
       • To determine if a crankshaft is bent ✓
       • To determine if a lathe is running true ✓
       • To determine if two pieces of equipment are the same size   (Any 3 x 1)   (3)
                                                                                         [8]

QUESTION 8: FORCES

8.1   Moments about **A:** (B x 8) = (800 x 2) + (640 x 4) + (350 x 10) ✓
                       =   1600 +   2560   +   3500 ✓
                    B   = 957,5 N ✓
       Moments about **B:** (A x 8) + (350 x 2) = (640 x 4) + (800 x 6) ✓
                    8A   +   700   =   2560   + 4800 ✓
                           A = 832,5 N ✓   (6)

8.2   Stress = $\frac{\text{Load}}{\text{Area}}$
       Area = (32 x 32) − (28 x 28) ✓
       $= \frac{20 \, x \, 20^3}{\frac{244}{10^6}}$ ✓
       = 240 ✓
       $= \frac{20 \, x \, 10^6 \, x \, 10^3}{244}$ ✓
       = 81967213,11 Pa ✓
       = 81,97 MPa ✓   (6)

8.3   Vertical Components:
       50 Sin 90° - 30 Sin 45° + 45 Sin 0° ✓
       = 50 - 21,2° + 0
       = 28,8 N ✓
       Horizontal Components:
       = 50 Cos 90° + 30 Cos 45° + 45 Cos 0° ✓
       = 0 + 21,2 + 45
       = 66,2 N ✓
       R² = X² + Y²
       = 66,2² + 28,8² ✓
       = 4 382,44 + 829,44
       = 5211,88 ✓
       R = 72,2 N ✓
       Direction of Resultant:
       Tan Θ = $\frac{Y}{X}$
            = $\frac{28,8}{66,2}$ ✓
            = 0,44
        Θ = 23,5° ✓
       Resultant has a magnitude of 72,2 N in a direction of 23° south of west ✓   (10)
                                                                                        [22]

QUESTION 9: MAINTENANCE

9.1   • When the thin of lubrication is compromised. ✓
     • When a machine is run at a rate higher than at which it was designed to operate. ✓
     • When oil or grease is effectively squeezed out of the machines bearing surfaces.   (Any 2 x 1) (2)

9.2   • The mass of the rotating element ✓
     • The extent to which the mass is off centre ✓
     • The speed of rotation ✓   (3)

9.3   • The friction force is in direct relation to the total force between the two surfaces. ✓
     • It is dependent on the size of the surfaces in contact with each other. ✓
     • It depends on the roughness of the surface and the material the workpiece is made of.
     • It is dependent on the movement speed.   (Any 2 x 1) (2)

9.4   If a body or system is at rest and stay at rest in any position, it will not turn or rotate under the influence of the force of gravity. ✓   (1)
       [8]

QUESTION 10: JOINING METHODS

10.1   • To hold parts ✓
     • To transmit motion ✓
     • To transmit power
     • To adjust parts with reference to one another   (Any 2 x 1) (2)

10.2   10.2.1   It is the top (outer) surface joining the two sides (flanks) of a screw head. ✓✓   (2)

      10.2.2   It is the bottom of the groove between the two sides (flanks) of the adjacent threads. ✓✓   (2)

      10.2.3   It is the centre line running longitudinally through the thread. ✓✓   (2)

      10.2.4   It is the distance between the crest and the root of the screw thread, measured perpendicular to the axis of the thread. ✓✓   (2)

      10.2.5   It is the angle included between the sides (flanked) of the thread measured in an axial plane. ✓✓   (2)
       [12]

QUESTION 11: SYSTEMS AND CONTROL

11.1   11.1.1   Anti-clockwise ✓ (1)

        11.1.2   Gear B turn in a clockwise direction which in turn will allow gear C to turn in an anti-clockwise direction. ✓ (1)

        11.1.3
- It is an intermediate gear for the rotation of two gears to turn in the same direction. ✓
- It can assist to reduce the size of the input/output gears whilst maintaining the spacing of the shafts. ✓ (2)

        11.1.4   It helps to transfer the power ✓ from driven to driver in the same direction. ✓ (2)

        11.1.5 $\pi \ x \ D_A \ x \ N_A = \pi \ x D_B \ x \ N_B$
$\pi \ x \ 380 \ x \ 900 = \pi \ x \ 150 \ x \ N_B$ ✓
$N_B = \frac{\pi \ x \ 380 \ x \ 900}{\pi \ x \ 150}$ ✓
     = 2280 rpm ✓ (3)

        11.1.6
- Spur gears are more expensive than belts. ✓
- Spur gears are noisy at high speeds. ✓
- Because the spur gears must be in mesh to work their centre, distance are limited. ✓
- A large amount of stress develops in spur gears. ✓ (4)

[13]

QUESTION 12: PUMPS

12.1   Gear pump ✓ (1)

12.2
- It has the ability to handle a wide range of viscosities. ✓
- It is less sensitive to cavitation. ✓
- Dit is relatief maklik om te onderhou en te herbou. ✓
- High speed
- High pressure
- No overhung bearing loads
- Relatively quiet operation (Any 3 x 1) (3)

12.3   **A**   Outlet port ✓
        B   Rotor ✓
        C   Vane ✓
        D   Pump housing ✓
        E   Inlet port ✓ (5)

12.4
- Complex housing ✓
- Not suitable for high pressures ✓
- Not suitable for high viscosity ✓
- Not good with abrasives (Any 3 x 1) (3)

[12]

TOTAL SECTION B: 100

SECTION C: AUTOMOTIVE (SPECIFIC)

QUESTION 13: TOOLS AND EQUIPMENT

13.1   • To determine the run-out of a flywheel ✓
       • To determine if a crankshaft is bent ✓
       • To determine if a work piece in the lathe is running true ✓
       • To determine if two pieces of equipment are the same size   (Any 3 x 1)   (3)

13.2   • Do not over tighten the locking screw. ✓
       • Do not force the telescopic plunges into the bore. ✓
       • Store gauges safely away after use. ✓
       • Take care when removing the telescopic gauge after measurement was taken.   (Any 3 x 1)   (3)

13.3   newton meter (Nm) ✓   (1)

13.4   • It prevents bolts or studs from breaking. ✓
       • It prevents bolts and studs from loosening. ✓
       • It prevents castings from warping.   (Any 2 x 1)   (2)

                                              [9]

QUESTION 14: ENGINES

14.1   • Mechanical fuel pumps ✓
       • Distributer ✓
       • Oil pumps   (Any 2 x 1)   (2)

14.2   They transmit rotary movement of the crankshaft gear to the camshaft gear so that the camshaft rotate at half speed of the camshaft. ✓✓   (2)

14.3   Tensioner ✓   (1)

14.4   Eight (8) ✓   (1)

14.5   14.5.1   • It controls the incoming and outgoing gases in the engine. ✓
                 • Opens and closes the port.   (Any 1 x 1)   (1)

         14.5.2   To keep them properly closed to prevent the loss of power ✓   (1)

14.6   14.6.1   • When the injector is energised, an electromagnet moves the plunger. ✓
                 • This opens the valve, allowing pressurised fuel to squirt out through a tiny hole. ✓
                 • When not energised, a spring pushes the plunger back down, allowing no fuel to exit. ✓
                 • How much the plunger opens is regulated by the amount of electricity sent to the fuel injector, ✓ causing the magnetic field to be stronger. ✓   (5)

         14.6.2   • Reliable ✓
                 • Cost effective ✓
                 • Physically smaller   (Any 2 x 1)   (2)

                                               [15]

QUESTION 15: SYSTEMS AND CONTROL

15.1   • Spiral bevel ✓
           • Hypoid ✓   (2)

15.2   Transmit torque ✓   (1)

15.3   15.3.1   • To transmit force from the steering centre link or the rack gear to the steering knuckle. ✓
                     • This causes the wheel to turn. ✓
                     • The outer tie rod end connects with an adjusting sleeve, which allows the length of the tie rod to be adjustable. ✓
                     • This adjustment is used to set a vehicle's alignment.   (3)

           15.3.2   • It is used for allowing free movement on two planes at the same time, including rotating in those planes. ✓
                     • Combining two such joints with control arms enables motion in all three planes, ✓allowing the front end of an automobile to be steered and a spring and shock (damper) suspension to make the ride comfortable. ✓   (3)

           15.3.3   • It changes the rotary motion of a crank or the steering box to a second crank or link in a different plane or axis. ✓
                     • It converts the sweeping motion of the steering box to the linear motion ✓ needed to pull the tie rods and ultimately turn the vehicle's wheels. ✓   (3)

15.4   • Reduced comfort while driving or travelling. ✓
           • Loss of stability and driver control. ✓
           • Life of tyre, transmission parts, springs, wheel bearings and steering linkages are shortened by the excessive bouncing motion of the wheels and body. ✓   (3)

15.5   It is fitted to reduce body roll above the spring and axles ✓ when the vehicle is cornering and thus helps the car on a more even keel. ✓   (2)

15.6   • Smoother engine performance because the torsion of the crankshaft is not concentrated on a specific section, but is distributed evenly over the length of the crankshaft ✓
           • The heat caused by the power strokes is evenly distributed and prevents local overheating or cooling: ✓
                o   causing minimal vibration to improve engine balance ✓
                o   achieving smooth running
                o   achieving longer engine life
                o   causing user comfort ✓   (4)

15.7   1-4-2-6-3-5 ✓   (1)

15.8   15.8.1   • A much higher voltage from the ignition coil is required ✓ to bridge the gap and may cause the ignition coil to overheat. ✓
                      • Misfiring occurs at high engine revolutions and at engine load because of insufficient voltage to bridge the gap. ✓
                      • The engine will be difficult to start, especially during cold conditions. ✓   (4)

          15.8.2   • The spark duration will be very quick and the spark will be thin and weak. ✓
                      • The effects of this may be bad starting and high exhaust emission levels. ✓
                      • Will result in an increase in fuel consumption. ✓
                      • A worn engine will cause carbon deposits to bridge the gap and will result in misfiring. ✓
                      • Uneven engine performance will cause loss of power. ✓   (4)
                                                                                                                          [30]

QUESTION 16: MAINTENANCE

16.1   • Lack of lubrication ✓
          • Overloading ✓
          • Friction ✓   (3)

16.2   • Type of material ✓
          • Diameter of the drill bit ✓
          • Material of which the drill is made ✓
          • Firmness with which the drill is made
          • Condition of the machine
          • Use of cutting fluid
          • Rate of feed   (Any 3 x 1)   (3)

16.3   • The pump is very efficient and can develop high pressure ✓
          • There are no reciprocating parts which can cause vibrations ✓
          • The drive is always positive ✓
          • It has no valve or springs   (Any 3 x 1)   (3)

16.4   • Can-type ✓
          • Cloth-type ✓
          • Filter-paper type
          • Screw-on filters   (Any 2 x 1)   (2)
                                                                                                                          [11]

QUESTION 17: FORCES

17.1   IP = Plan where   P = 1 500 kPa = 1 500 x 10^3
                                L = 95 mm = 95 x 10^{-3}
                                A = $\frac{\pi D^2}{4}$
                                N = 3000 r/min = $\frac{3000}{60\ x\ 2}$ = 25 r/s
                                n = 4 (No. of cylinders)

IP = $\frac{1500\ x\ 10^3\ x\ 95\ x\ 10^{-3}\ x\ \pi\ (0,07)^2 x\ 25\ x\ 4}{4}$ ✓✓✓

                        = 69 825 watt ✓
                        = 69,825 kW ✓   (5)

17.2   Torque = Force x radius ✓
                        = 250 x $\frac{400}{1000}$ ✓
                        = 100 Nm ✓   (3)

17.3   It is the ratio of compression of the inlet charge ✓ during the compression
          stroke in the combustion chamber ✓ to the total volume of the cylinder. ✓   (3)

17.4   SV = Area of cylinder x Length of stroke
                = $\frac{\pi D^2}{4}$ x 120 ✓
                = $\frac{3,142(0,11)^2}{4}$ x 0,12 ✓
                = 0,00114 cm^3 ✓ or 1,14 x 10^{-3} m^3

          Compression ratio = $\frac{Swept\ Volume+Clearance\ Volume}{Clearance\ Volume}$ ✓
                        = $\frac{0,00114\ +95}{95}$ ✓
                        = 2,2 ✓   (6)

17.5   17.5.1   joule (J) ✓   (1)

          17.5.2   watt (W) ✓   (1)

17.6   • Indicated mean effective pressure (IMEP) ✓
          • Break mean effective pressure (BMEP) ✓   (2)
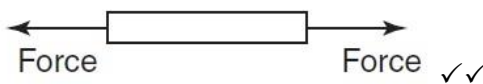
17.7   17.7.1
                        Pulling ✓   Force   Force ✓✓   (3)

          17.7.2
                        Pushing ✓   ✓✓   (3)

          17.7.3

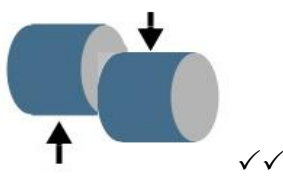   Cutting ✓   ✓✓   (3)
                                                                            [30]

QUESTION 18: TERMINOLOGY

18.1　18.1.1　The entrepreneur interested in opening a workshop ✓ should be
　　　　　　sure that he/she has the ability to manage the business as well as
　　　　　　to keep the customer and staff happy. ✓　　　　　　　　　　(2)

　　　18.1.2　The capital needed to buy or lease the premises, ✓ the
　　　　　　availability of a bank loan and the interest rate payable should be
　　　　　　established. ✓　　　　　　　　　　　　　　　　　　　　(2)

　　　18.1.3　The number of workers at the work place other than the general
　　　　　　manager e.g. workshop foreman, ✓office staff, receptionist,
　　　　　　mechanics, apprentices and labourers. ✓　　　　　　　　　(2)

　　　18.1.4　The site where you going to do business to attract customers,
　　　　　　e.g. close to a main road, ✓ or in a highly-developed area or even
　　　　　　in a densely populated residential area. ✓　　　　　　　　(2)
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　[8]

　　　　　　　　　　　　　　　　　　　TOTAL SECTION C:　**100**

　　　　　　　　　　　　　　　　　　Please turn over

SECTION D: WELDING AND METALWORK (SPECIFIC)

QUESTION 19: JOINING METHODS
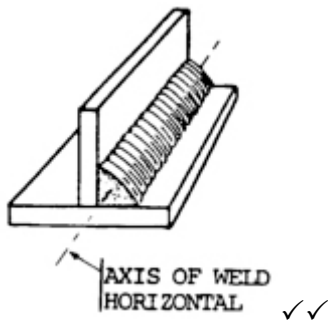
19.1   19.1.1   Single bevel-butt ✓✓   (2)

         19.1.2   Fillet joint ✓✓   (2)

         19.1.3   Double bevel butt ✓✓   (2)

19.2   Flat position ✓
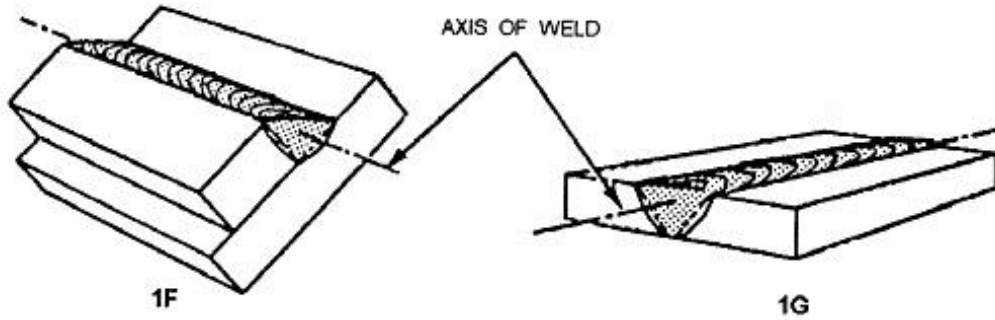
19.2   Horizontal position ✓

                                               ✓✓   (3)

19.3   **A**   Parent or base metal ✓
            B   Face of weld ✓
            C   Fusion zone ✓
            D   Toe of weld ✓
            E   Heat affected zone ✓
            F   Root face ✓   (6)

                                                               [18]

QUESTION 20: TOOLS AND EQUIPMENT

20.1
- Taper taps ✓
- Intermediate ✓
- Plug/bottoming tap ✓ (3)

20.2 20.2.1 6,8 mm ✓ (1)

20.2.2 8,5 mm ✓ (1)

20.2.3 10,2 mm ✓ (1)

20.3 It is a shearing machine. ✓ (1)

[7]

QUESTION 21: FORCES

21.1 VC : 8 Sin 60° = 6,9 N ✓   HC : 8 Cos 60° = 4 N ✓
6 Sin 0° = <u>0 N</u> ✓   6 Cos 0° = <u>6 N</u> ✓
6,9 N ✓   10 N ✓

$R^2 = X^2 + Y^2$
$= 10^2 + 6,9^2$
$= 100 + 47,61$
$R = \sqrt{147,61}$
R = 12,15 N ✓

Calculate the direction of the resultant as follows:

$\text{Tan } Ø = \frac{Sum\ Y}{Sum\ X}$
$= \frac{6,9}{10}$
$= 0,69$
$Ø = 34,6°$ ✓

The resultant has a magnitude of 12,15 N ✓ in a direction of 34,6° NE (North East) ✓ (10)

21.2 Scale 1 N = 20 mm
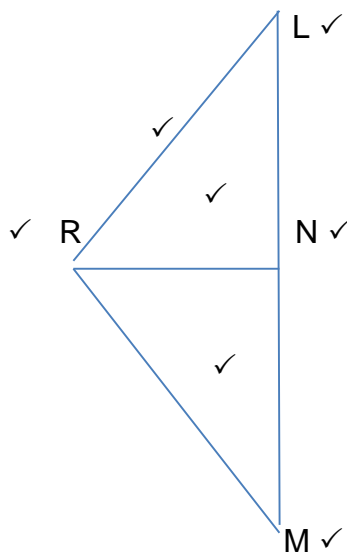
(7)

[17]

QUESTION 22: MAINTENANCE

22.1 • Check electrical switches and the conditions of wiring. ✓
      • Lock out and tag the machine and check the guarding as follows: ✓
        o Check that all guards are secure and function correctly.
        o Clean machine of all foreign matter.
        o Check whether the upper roller can freely be adjusted between upper
           and lower limits.
        o Check the machines general operations.
        o Check if the bottom two rollers can rotate freely in both the positive and
           reverse directions.   (Any 2 x 1)   (2)

22.2 It will result in wear and damage ✓ to moving components. ✓   (2)

22.3 To cut or punch steel ✓ that is thicker than the rated thickness ✓   (2)
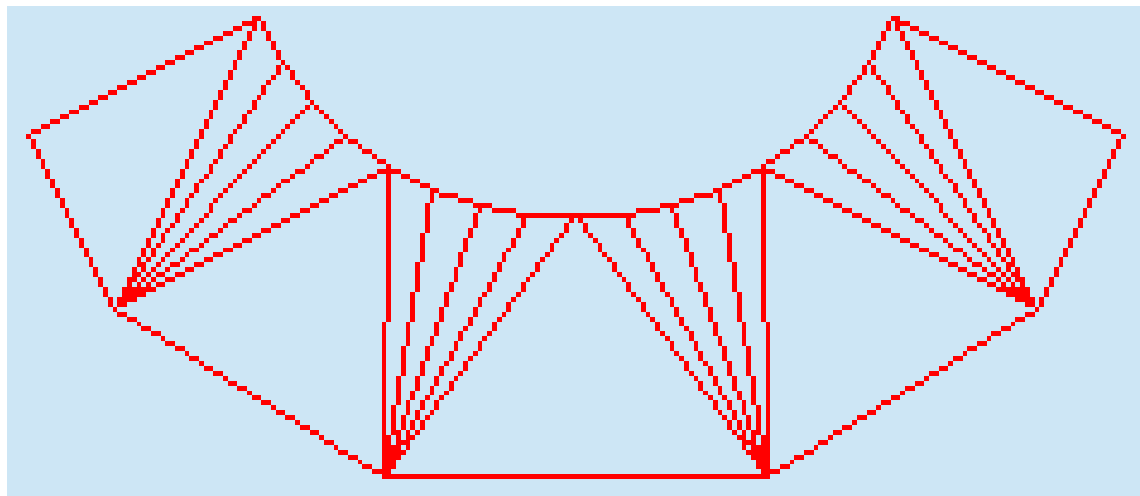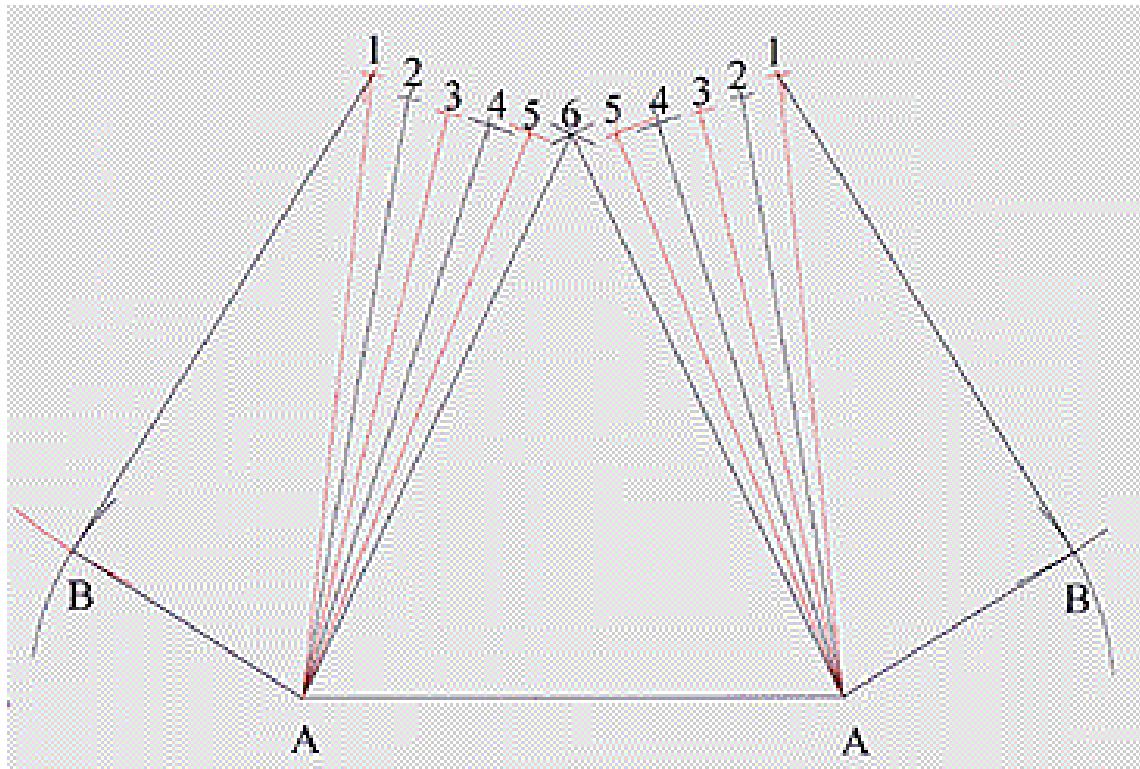   **[6]**

QUESTION 23: JOINING METHODS

23.1 To prevent distortion ✓ as the heat of the fusion weld moves progressively along
      the weld joint. ✓   (2)

23.2 • Butt-joint ✓
      • Lap-joint ✓
      • Corner-joint ✓
      • Corner T-joint ✓
      • Edge-joint ✓   (5)

23.3 23.3.1 Flat-position ✓   (1)

      23.3.2 Horizontal position ✓   (1)

      23.3.3 Vertical position ✓   (1)

      23.3.4 Overhead position ✓   (1)

23.4 • Forehand ✓
      • Perpendicular ✓
      • Backhand ✓   (3)

23.5 • Incomplete penetration ✓
      • Porosity
      • Undercutting
      • Weld craters and faulty starts
      • Slag inclusion
      • Cracks   (Any 1 x 1)   (1)
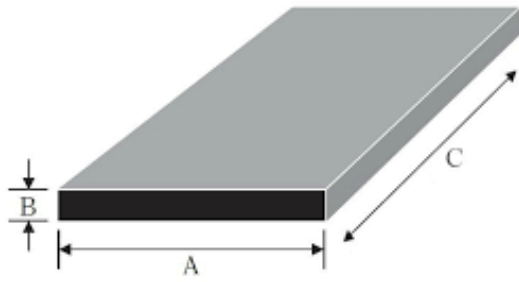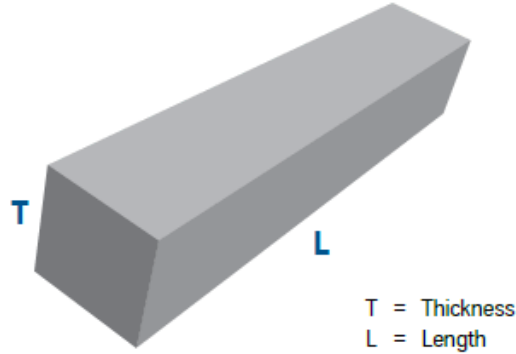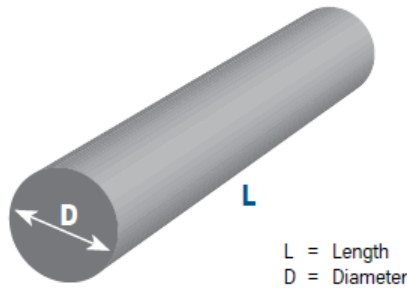   **[15]**

QUESTION 24: TERMINOLOGY

24.1

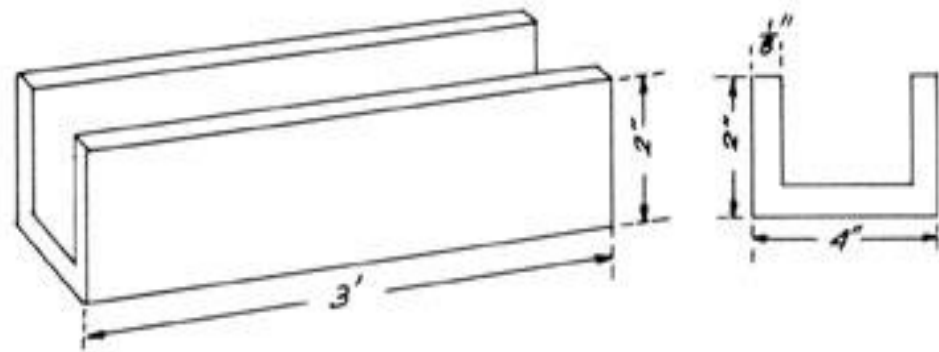[19]

QUESTION 25: STEEL SECTIONS

25.1   25.1.1

(2)

25.1.2

T = Thickness
L = Length

(2)

25.1.3

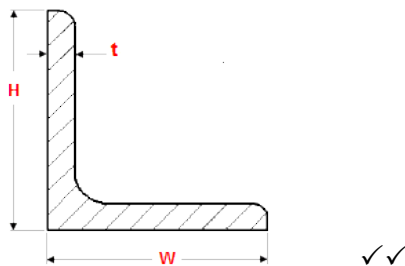L = Length
D = Diameter

(2)

25.1.4


(2)

25.1.5

✓✓

(2)

Please turn over

25.2   It is the process of cutting out a section of steel ✓in order to form a snug fit
       with the flange of a corresponding section. ✓   (2)

25.3   • Column cap ✓
       • Knee brace ✓
       • Welded gantry bracket ✓
       • Beam to beam connection
       • Beam to station connection
       • Bending moment connection
       • Extension of steel stanchions
       • Bolted base
       • Welded column
       • Plate anchor
       • Welded stay   (Any 3 x 1)   (3)

25.4   Steel mills ✓   (1)

25.5

          Toe-up   Toe-down   (2)

                                         [18]
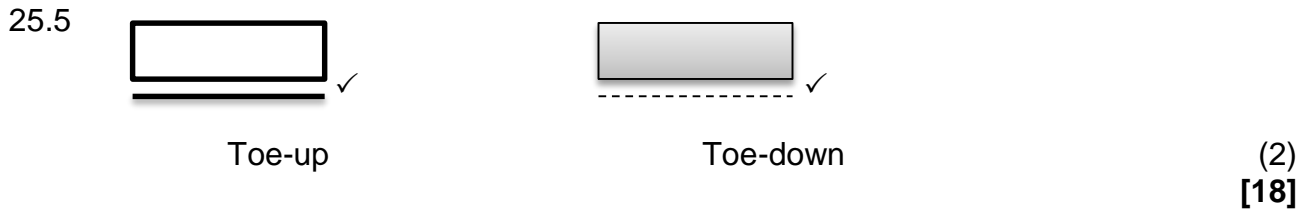
                          TOTAL SECTION D: 100
                                   GRAND TOTAL: 200