higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

MECHANICAL AND DRAWING-OFFICE ORIENTATION

XX AUGUST 2019

This marking guideline consists of 7 pages.

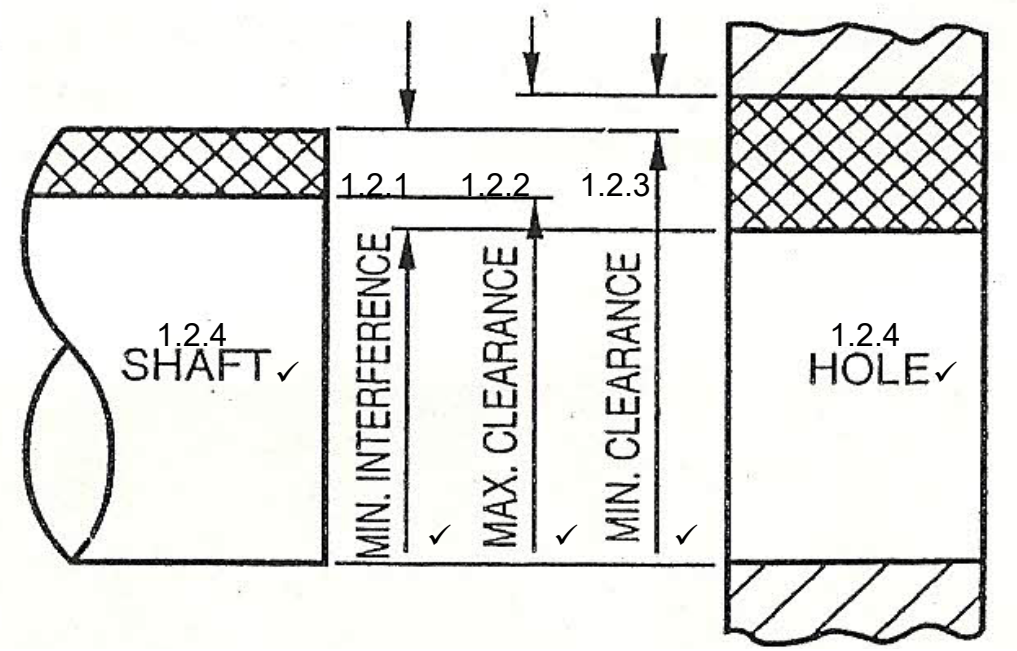
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QUESTION 1: INTRODUCTION

1.1
- Prepares design layouts and production drawings for clients
- Performs various calculations to ensure that the various components that are to be manufactured or structures that are to be erected will be strong enough to withstand the forces they will be exposed to
- Selects suitable materials and appropriate manufacturing methods
- Provides estimates of the bills of materials required and overall cost of manufacture or construction and erection
- Stores all drawings, supporting technical data/information and reference material
- Provides technical services and liaisons both internally and externally

(Any 4 × 1) (4)

1.2



SECTIONAL DRAWING OF A TRANSITION FIT

(3 for drawing + 5 for components) (8)

[12]

QUESTION 2: DRAWING-OFFICE LAYOUT AND EQUIPMENT

2.1
- Drawing number
- Drawing scale
- Drawing title
- Name or code to identify the draughtsperson
- Date on which the drawing was done
- Revision date
- Client name
- Project title

(Any 5 × 1) (5)

2.2
- Drawing number
- Expected return date
- Contact number of the person who took the drawing
- Name of the person that issued the drawing
- Issuing date (5)

[10]

QUESTION 3: ENGINEERING MATERIALS AND HEAT TREATMENT

3.1
- Hardening
- Tempering
- Annealing
- Normalising
- Carburising
- Surface hardening (Any 5 × 1) (5)

3.2 **Properties:**
- Silver-white colour
- Malleable
- Shine or glow
- Easily pulled or stretched into a thin wire
- Good transmission of heat or electricity
- Very soft (Any THREE)

Uses:
- Coat other metals to prevent corrosion such as tin cans
- Alloys of tin used to make soft solder
- Tin chloride used as a mordant in dyeing textiles
- Niobium-tin alloy used for superconducting magnets
- Tin oxide used for ceramics (Any THREE)

(3 + 3) (6)

3.3
- This is a surface-hardening process used for low-carbon steel. The articles are heated in a carburising furnace with a nitrogenous atmosphere. The furnace is sealed to prevent air (oxygen) from coming into contact with the articles.
- Ammonia gas (a chemical combination of nitrogen and hydrogen) is admitted through a special inlet so that it will come into contact with the articles. Provision is made for the used gas to be discharged through an outlet.
- At increased temperatures the ammonia gas is split into its two elements (hydrogen and nitrogen). The nitrogen then combines with the surface of the steel to form nitrides of which the hardness exceeds that achieved by any carbon-hardening process.
- Nitride steel is hard enough to cut glass. This cannot be said of carbon case-hardened steel. The soaking period takes about five hours at temperatures of between 550 °C and 650 °C. (4)

[15]

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QUESTION 4: MACHINING

4.1 4.1.1 True
4.1.2 True
4.1.3 False
4.1.4 True
4.1.5 True

(5 × 1) (5)

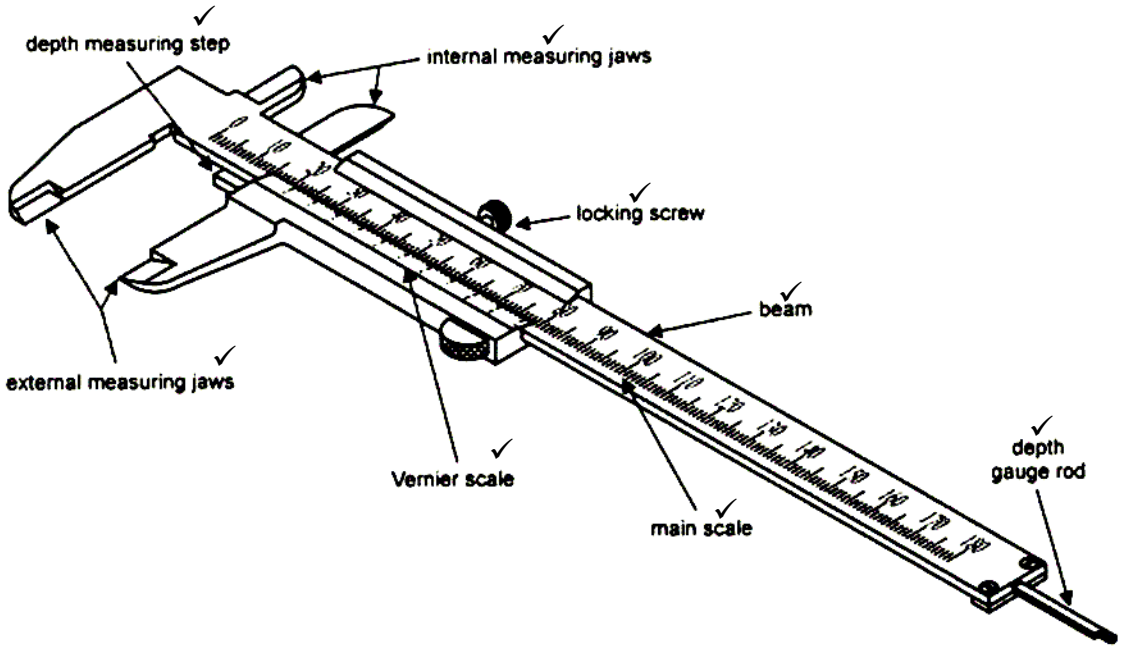
4.2 Chamfering removes burrs and sharp edges making handling safe. (2)

4.3 Milling is the machining process of using rotary cutters to remove material from a workpiece by advancing (or feeding) in a direction at an angle with the axis of the tool. (3)

[10]

QUESTION 5: MEASURING INSTRUMENTS

5.1



(8)

5.2
- Anvil
- Spindle
- Lock
- Barrel
- Thimble
- Ratchet
- Frame

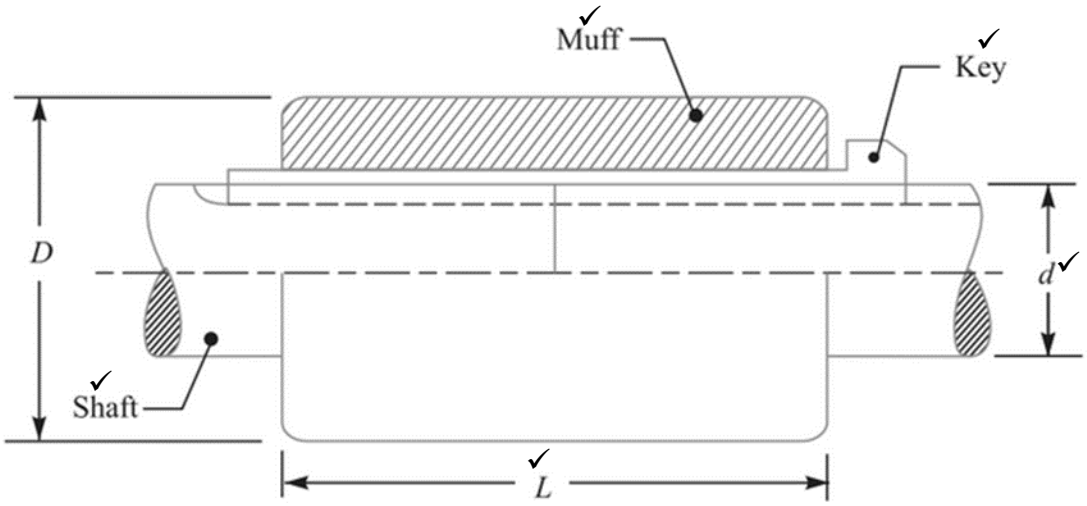
(Any 2 × 1) (2)

[10]

QUESTION 6: KEYS, PULLEYS, CLUTCHES, COUPLINGS AND SCREW THREADS

6.1
- A jaw coupling is a type of general-purpose power-transmission coupling that can also be used in motion-control (servo) applications.
- They are best adapted to slow speeds and positions where slip cannot take place and are ideal for transmitting heavy loads. (2)

6.2



MUFF COUPLING

(3 for drawing + 2 for labelling) (5)

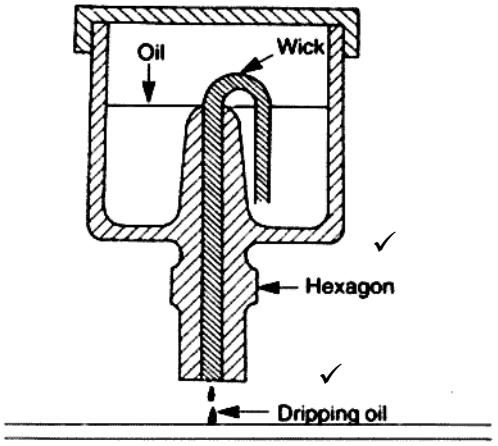
6.3 Universal coupling (1)

6.4 D = Width × 4
= 0,02 × 4
= 80 mm (1)

[9]

QUESTION 7: BEARINGS AND LUBRICATION

7.1 This lubricator is filled with oil to within 10 mm of the top of the central tube and the wick soaks up the oil by capillary action until it is saturated. The part of the wick inside the tube is carried on a piece of twisted wire which compresses the wick and reduces its capacity to retain the oil. Gravity and vibration cause the oil to drip off the lower end of the wick within the tube. The amount of lubricant may be adjusted by changing the size of the wick or by tightening the twisted wire which encloses it. More strands of the wick are necessary in cold weather than in hot weather since the oil is thicker when cold.



(5)

7.2
- Price of the lubricant
- Rubbing pressure between the two surfaces
- Rubbing speed of the two bearing surfaces
- Temperature to which the lubricant will be exposed
- Clearance between the two surfaces (Any 4 × 1) (4)

7.3 Flash point is the temperature at which an oil or grease gives off inflammable vapours. (1)

[10]

QUESTION 8: GEAR DRIVES

8.1 An epicyclical gear train consists of two gears mounted so that the centre of one gear revolves around the centre of the other. A carrier connects the centres of the two gears and rotates to carry one gear, called the planet gear, around the other, called the sun gear. (2)

8.2 8.2.1 The thickness of the tooth measured at the pitch circle or the length of the chord which subtends the arc of the pitch circle

8.2.2 The angle that the pressure of the two faces makes with a line at right angles to the centre line of the two gears – common pressure angles are 14,5° and 20°

8.2.3 Used to develop the involute form of a tooth – this circle is smaller than the pitch circle

8.2.4 The radial distance from the top of one tooth and the bottom of the mating tooth space of two gears in mesh

8.2.5 The clearance that exists behind a pair of meshing teeth

(5 × 1) (5)

8.3
- Direct drive
- Speed reduction
- Reverse rotation
- Neutral

(Any 3 × 1) (3)

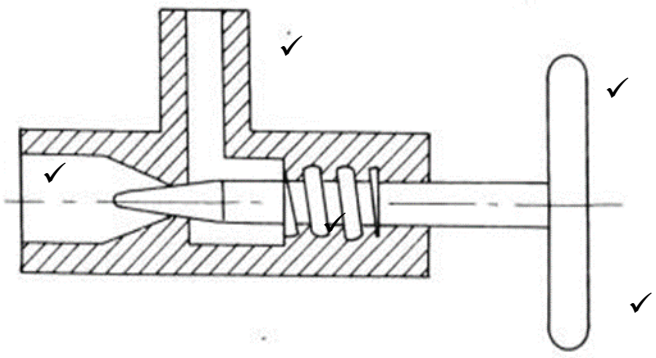
[10]

QUESTION 9: VALVES, PUMPS AND PIPE FITTINGS

9.1 A – Delivery pipe
B – Delivery head
C – Static head
D – Suction head
E – Suction pipe
F – Water level

(6 × 1) (6)

9.2



(4)

9.3 A relief valve or pressure-relief valve (PRV) is a type of safety valve used to control or limit the pressure in a system. Pressure might otherwise build up and create a process upset, instrument or equipment failure. The pressure is relieved by allowing the pressurised fluid to flow from an auxiliary passage out of the system. The relief valve is designed or set to open at a predetermined set pressure to protect pressure vessels and other equipment from being subjected to pressures that exceed their design limits. (4)

[14]

TOTAL: 100

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