higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

PATTERNMAKERS' THEORY N2

18 November 2020

This marking guideline consists of 5 pages.

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QUESTION 1

1.1 1.1.1 Top gating
1.1.2 Bottom gating
1.1.3 Side gating

(3 × 1) (3)

1.2 1.2.1 Parallel finger gates
1.2.2 Parallel finger gates
1.2.3 Circumferentially placed gates

(3 × 1) (3)

1.3 The principle of directional solidification✓ means that cooling is controlled✓ by designing the mould and utilising the intrinsic✓ design of the casting so that freezing begins✓ in those parts of the mould furthest✓ from the feeder heads and continues through the casting✓ towards the feeder heads.✓ These are designed to solidify last✓ so as to supply liquid metal throughout freezing. The practical approach to directional solidification is based on a variety of measures✓ to steepen those temperature gradients which lie in favourable directions.✓ These measures include control✓ of pouring rate and temperature,✓ differential cooling by chilling✓ and differential heating✓ with the aid of exothermic materials. (14)

[20]

QUESTION 2

2.1
- Enough hardness as well as strength in both dry and green state to support its own weight and withstand the force of molten metal✓✓
- Permeable to allow gases to escape easily✓
- Able to withstand high temperature of molten metal✓
- Should produce minimum amount of gas when in contact with molten metal so that high permeability is not needed, and greater strength is imparted to core✓✓
- Collapsible, that is disintegrate and collapse after metal solidifies. If not, difficulty may be experienced in removing it from casting✓✓ (8)

2.2 Shrinkage is the proportion by which something shrinks✓ while contraction is a reversible reduction in size.✓ (2)

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2.3
- Lathe
- Sanding machine
- Band saw
- Dividing head (4)

2.4 2.4.1 Primarily used to produce cylindrical✓ and plane surfaces at a right angle to the axis of rotation.✓ It can also produce tapers and bellows.

2.4.2 Rotates a workpiece about an axis to perform various operations such as cutting, sanding, knurling, drilling, deformation, facing, and turning,✓ with tools to create object with symmetry✓

2.4.3 Rotates cylindrical object✓ against tool that individual controls. Forerunner of all machine tools✓

(3 × 2) (6)
[20]

QUESTION 3

3.1
- Blowholes
- Holes
- Entrapped air
- Interrupted pour
- Core gasses
- Joints
- Surface
- Metal penetration
- Surface
- Misrun
- Wet sand
- Porosity shrinkage
- Broken in runners
- Scab
- Cold shut
- Blind
- Cold lap
- Dumb
- Contraction rack
- Rat-tail
- Core – misplaced
- Shrinkage
- Crush
- Slag
- Drop
- Strain
- Flash or fin
- Swell
- Gas holes
- Warping (30 × ½) (15)

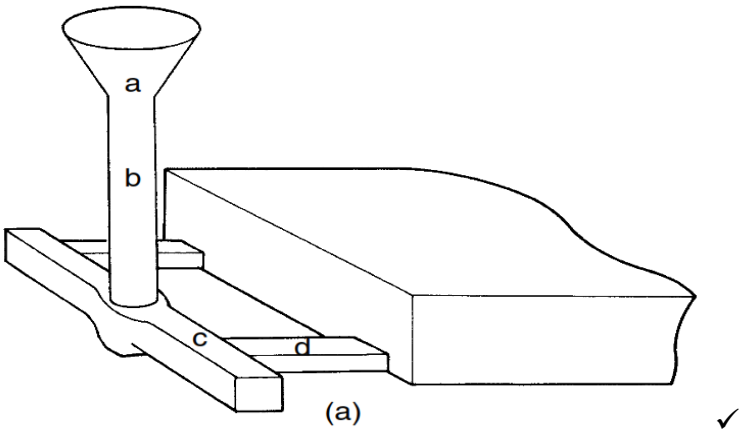
3.2
- Gate should be placed in such a way that stream of metal does not strike heavily against any sand in mould and for as short as possible to reduce amount of waste metal.
- Metal entering mould must not spatter onto sides.
- Sharp corners in course of metal entering mould should be avoided.
- Flow of metal after entering mould should not be far.
- Down-gates and ingates must be large and numerous enough to fill mould quickly.
- Stream of metal should enter mould in such a way that eddy currents will not be produced.
- Ingate should be placed where it is easily cut off.
- Ingate should not be placed where it will pull away from casting or cooling or where it will produce cooling strains.
- Ingate should not be placed where it will produce shrinkage cavity. (Any 5 × 1) (5)

[20]

QUESTION 4

4.1
- CO_2
- Resin and catalyst (2)

4.2 a – pouring cup✓ b - sprue✓ c and d – runner and ingate✓



✓

(4)

4.3 4.3.1 Silica sand to which chemicals or organic matter have been added
4.3.2 Silica sand from which all moisture has been removed
4.3.3 Moulding sand which have been in contact with hot molten metal
4.3.4 Sand which is still moist and has not been dried
4.3.5 Normal mixed molding sand
(5 × 2) (10)

4.4 Taper is necessary to allow pattern to be removed from mould. (1)

4.5 Wooden patterns require more taper than metal patterns because of greater frictional resistance of wooden surfaces.✓ Allowance is provided on pattern if casting is to be machined.✓ This allowance is given in addition to shrinkage allowance.✓ (3)
[20]

QUESTION 5

5.1 Shining cavities,✓ usually near the top,✓ and at awkward corners✓ near risers
Caused by entrapped air✓
Can be remedied by smaller✓ or whistler risers.✓ Degree of ramming✓ or mould hardness✓ as well as permeability of sand✓ should be checked (10)

5.2 Contraction crack
Formed by the sections pulling✓ against each other during✓ and after casting,✓ covered or uncovered✓ by moulding sand
Caused by bad design✓ – absence of fillets and runners✓ or risers too heavy and wrongly positioned✓
Can be remedied by using weaker sand for mould and core.✓ Ease after casting.✓ Do not strip large castings too early.✓ (10)
[20]

TOTAL: 100

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