UNIVERSITY OF JOHANNESBURG

FACULTY	**: FEBE**
DEPARTMENT	**: Metallurgy**
CAMPUS	**: DFC**
MODULE	**: FTY 302** **FOUNDRY TECHNOLOGY 3 – SUPPLEMENTARY EXAM**
SEMESTER	**: Second**
EXAM	**: January 2020**

DATE	: **TBA**	**SESSION**	**: TBA**
ASSESSOR(S)	: **MR KKC KYALU**		
MODERATOR	: **MR I KILONGOZI**		
DURATION	: **3 HOURS**	**MARKS**	: **75 (FM)**

NUMBER OF PAGES: **6** PAGES

INSTRUCTIONS:

1. Answer ALL THE QUESTIONS.
2. Return the question paper

QUESTION 1

The production of a new steel casting reveals that it has a particular type of defect shown in figure 1. This casting is produced in a silica-based greensand mould. The Methoding of the casting consists of an aided feeding method using Kalmin insulator feeder sleeves and a pressurized side gating system. As the plant metallurgist, you are asked to:

1.1 Identify the casting defect and provide two salient features of this type of defect (5)

1.2 Fully explain the mechanism of defect formation in the case of silica sand used as the refractory sand for the mould (10)

1.3 Fully explain the possible effects (if any) of the following changes to the Methoding system in alleviating the casting defect problem:

1.3.1 Bottom gate pouring (2)

1.3.2 Increase number of feeders (2)

1.3.3 Increase of metal superheat (2)

1.3.4 Casting filtration using ceramic filters (2)

1.3.5 Increase filling rate (2)

Figure 1 Casting defect in steel cast component

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QUESTION 2

Your boss is reluctant to motivate for the purchase of X-Ray Radiography facility for the foundry. You believe that it is important for the company that supplies high tech-component for military equipment to Denel. You have been invited to make a presentation at the strategic planning of your company that takes place in Abu Dhabi to explain how this technology operates and what benefits will it provided to the company.

2.1 The functioning principle of the above-mentioned technologies (5)

2.2 What casting defects could be detected by the above analysis/ testing technologies? (5)

2.3 The implementation and integration of these technologies in the existing quality assessment and control system in place in the foundry (in relation to a ductile iron foundry) in order to improve the casting quality. (10)

2.4 Possible health and safety related issues to consider during the application of x-ray radiography. (5)

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QUESTION 3

Question 3 refers to the Manganese casting shown in figure 1. The Methoding data used to produce this casting are provided in Table 2.

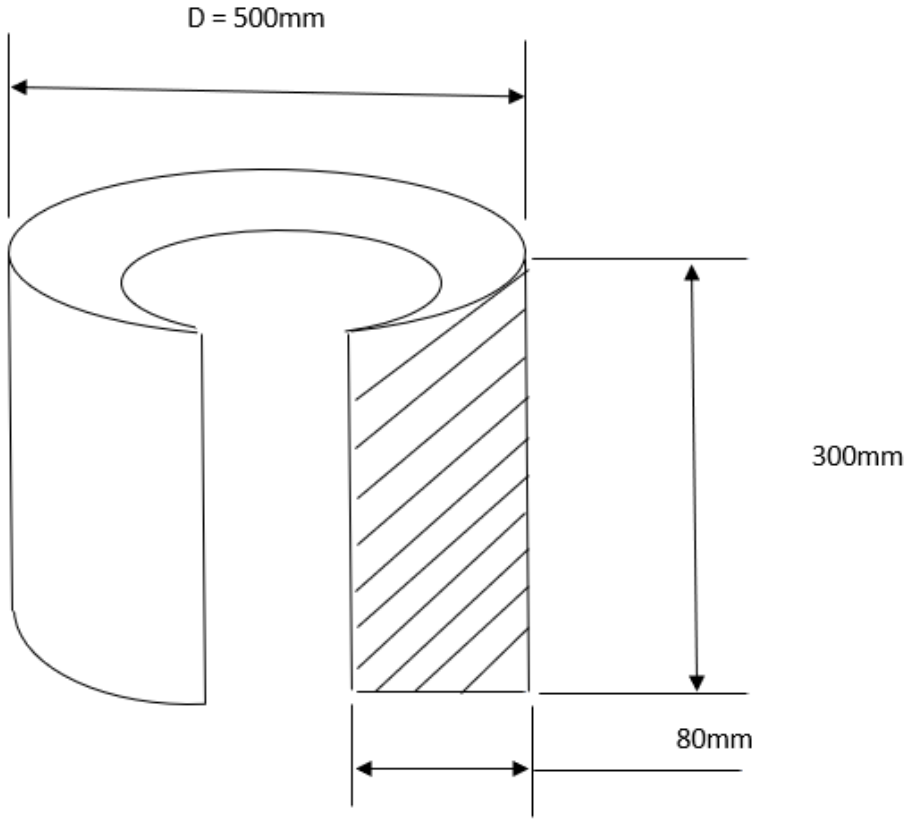

Figure 2 Technical drawing of Manganese casting

Table 1. Data related to the Methoding system of the casting

Casting	
Casting net weight	200kg
Speed Factor	1.5
% Shrinkage	6%
Alloy density	7.85 kg/dm^3
Moulding	Greensand moulding (chromite sand based) Vertical moulding
Feeding system	
Aided feeding	RMS sleeves
Dimensions (h, d)	h = d
Modulus Extension factor	m.e.f: 1.5
Pouring temperature	1480 ^{0}C

3.1 Based on your calculations, is this casting a plate or a bar? (5)

3.2 Calculate the modulus of the casting (5)

3.3 With D=H, for an RMS cylindrical sleeve with a m.e.f of 1.5, calculate the sizes of the sleeve (5)

3.4 How many sleeves will you require if no chills are used? (5)

3.5 How many sleeves will you require if chills are used? (5)

3.6 If the pouring weight is 250kg for the above casting

3.6.1 Will your running system be pressurised or not? (2)

3.6.2 Calculate the sizes of your Down gate, the Runner Bar and the Ingates if 2 Ingates will be used (9)

3.6.3 What will the mould filling or pouring time be? (4)

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