



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

**2022/2023 ACADEMIC YEAR
THIRD YEAR SECOND SEMESTER EXAMINATIONS**

**FOR THE DEGREE
OF
BACHELOR OF TECHNOLOGY EDUCATION
(MECHANICAL)**

COURSE CODE: TEM 382

**COURSE TITLE: MECHANICAL TECHNOLOGY AND
PRACTICE IV**

DATE: 17/04/2023

TIME: 8.00- 10.00 AM

INSTRUCTIONS

- Answer questions ONE and any other TWO questions.
- All dimensions are millimetres

Time : 2 hours.

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over

QUESTION ONE (30 MARKS)

- a) Give any three hazards that may be associated with casting process. (3marks)
- b) Identify any three factors that dictate the choice of a melting device for casting process. (3 marks)
- c) Quality of a cast product is influenced by how well the liquid material flows in a specific channel before being stopped by solidification. Briefly explain any four factors that influence this flow. (8 marks)
- d) Briefly explain the occurrence of each of the following defects in a casting.
 - i) Blow holes
 - ii) Shrinkage cavity
 - iii) misrun
 - iv) mismatch (4 marks)
- e) Figure Q1(i) shows a sand mould cavity that was used by a student to do some casting. Upon casting, recovery and inspection, the product was found to have a crack as shown in figure Q1(ii). Explain the occurrence of this crack and how it would have been prevented. (4marks)

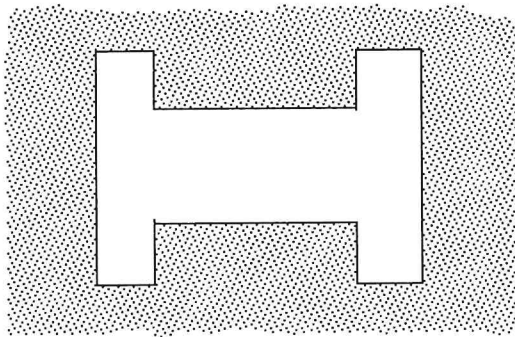


Fig Q1(i)

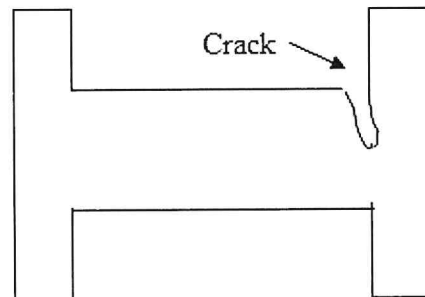


Fig Q1(ii)

- f) i) Explain what is meant by the term “unpressurized gating system” (1.5 marks)
ii) Justify the statement that “In unpressurized system, the casting yield is low” (2.5 marks)
- g) Explain any four factors that dictate the choice the inspection technique for a cast product. (4 marks)

QUESTION TWO (20 MARKS)

- a) “pattern and cast product in most cases are not the same”. Briefly explain any four circumstances under which this statement is true. (4marks)
- b) A solid cylinder measuring 140 in diameter and 200 in height is to be sand cast. The solid is moulded entirely in the drag of a green sand flask; it is not risered and is top gated. The cope of the flask is 240 high, and the height of melt during pouring (in the pouring basin) is 100 above the cope. A tapered sprue with 28mm² exit area is used. If the gating ratio in this set up is 1:3:3,
 - i. Determine the entrance area of the sprue to assure that aspiration does not occur, giving the assumption(s) taken
 - ii. Determine the velocity of the melt as it enters the mould cavity
 - iii. Establish the time that will be taken to fill the mould cavity (16 marks)

QUESTION THREE (20 MARKS)

- a) Cross section of a casting produced by a student is shown in figure Q3. Upon inspection shrinkage defect was found in the region marked **X**.
- Explain the occurrence of this defect
 - With aid of sketches explain various methods the student could have employed to minimize chance of such a defect. (13marks)

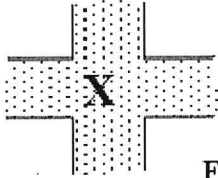


Fig. Q3

- b) Describe the process of carrying out die penetrant inspection method. Which casting defects can be exposed using this method. (7 marks)

QUESTION FOUR (20 MARKS)

- a) Describe the shell moulding process. What are the main advantages of this method over other sand casting methods. (10 marks)
- b) i) State Chvorinov rule on solidification time. (1 mark)
- ii) Sand casting **X** and **Y** are geometrically similar. **Y** weighs four times as much as **X**; **Y** freezes in 15 minutes. How long will it take **X** to freeze. Give assumptions taken. (9 marks)

