



PROGRAM : NATIONAL DIPLOMA
ENGINEERING METALLURGY

SUBJECT : MATERIALS TESTING: METALLURGY
III

CODE : MTM 3111

DATE : SSA EXAMINATION 2015
16 JULY 2015

DURATION : 11:30- 14:30

WEIGHT : 40: 60

TOTAL MARKS : 100

EXAMINER : MR T MADZIVHANDILA 082011303

MODERATOR : DR DK NYEMBWE 5130

NUMBER OF PAGES : 3 PAGES

INSTRUCTIONS : ONE CALCULATOR ALLOWED PER STUDENT

INSTRUCTIONS TO CANDIDATES:

PLEASE ANSWER ALL THE QUESTIONS.

QUESTION 1

Discuss the basic assumptions of Strength of Material (Science).

[6]

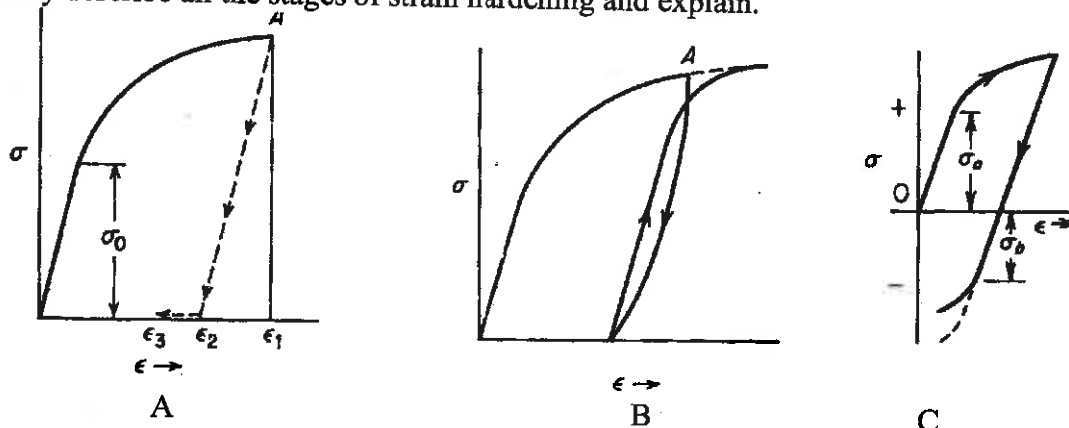
QUESTION 2

Discuss 4 factors affecting shape and magnitude of stress-strain curve.

[12]

QUESTION 3

Briefly describe all the stages of strain hardening and explain.



[15]

QUESTION 4

4.1 A 13 mm diameter tensile specimen has a 50 mm gauge length. The load corresponding to the 0.2% offset is 6800 kg and the maximum load is 8400 kg. Fracture occurs at 7300 kg. The diameter after fracture is 8 mm and the gauge length at fracture is 65 mm. Calculate the standard properties of the material from the tension test. (15)

4.2 With the aid of a diagram differentiate between engineering stress-strain curve and true stress strain curve. (5)

[20]

QUESTION 5

5.1 Discuss the three general types of hardness measurements. (6)

5.2 What is the correlation between hardness and tensile Strength in metallic material? (4)

[10]

QUESTION 6

6.1 Where do fatigue failure usually originate in a metal ? (2)

6.2 How does the *SN* curve of a carbon steel differ from that of a high strength aluminium alloy? (4)

6.3 Explain 5 factors that may affect fatigue strength. (15)
[21]

QUESTION 7

7.1 Draw a typical creep curve for a metal under constant load and at a relatively high temperature, and indicate on it all three stages of creep.

[10]

QUESTION 8

8.1 Which of the following is a prerequisite for a penetrant test?

- (a) Developer must be applied in a thin, even coat
- (b) Any surface coatings or soils must be completely removed
- (c) All traces of penetrant materials should be removed after testing is complete
- (d) The test object must be non-magnetic

8.2. Acceptable methods of penetrant application are:

- (a) Spraying
- (b) Dipping
- (c) Brushing
- (d) All of the above

8.3. In the solvent removable penetrant process, excess penetrant is removed with:

- (a) A water spray
- (b) A hydrophilic scrubber
- (c) A solvent spray
- (d) Clean, lint free towels slightly moistened with solvent

[6]

FULL MARKS: 100