



ZIMBABWE

**MINISTRY OF HIGHER AND TERTIARY EDUCATION,
INNOVATION, SCIENCE AND TECHNOLOGY
DEVELOPMENT**

**HIGHER EDUCATION EXAMINATIONS COUNCIL
(HEXCO)**

NATIONAL CERTIFICATE

IN

ELECTRICAL POWER ENGINEERING

MODULE: Plant Installation and Maintenance PAPER NO: 321/18/S01

DURATION: 3 Hours

NOVEMBER/DECEMBER 2025 EXAMINATION

REQUIREMENTS

- 1) Answer booklet.
- 2) Non-programmable scientific calculator.

INSTRUCTIONS TO CANDIDATE

- 1) Answer all questions.
- 2) Each question carries ten (10) marks.
- 3) Begin the answer to each new question on a fresh page.

This paper consists of 4 printed pages.

QUESTION 1

- a) Briefly describe how electricity is generated in a hydro-electric power station. (4 marks)
- b) Explain three (3) advantages of stepping up generation voltages for transmission voltages for transmission in a power system. (6 marks)

QUESTION 2

- a) Outline the function of each of the following substation equipment:
 - i) H.V switchgear (1 mark)
 - ii) Transformer (1 mark)
 - iii) L.V switchgear (1 mark)
 - iv) Distribution board (1 mark)
- b) State any three (3) IEE regulations that pertain to equipment used in an indoor substation. (6 marks)

QUESTION 3

- a) Define the following terms as applied to isolation and switching:
 - i) Switchgear (2 marks)
 - ii) Over current (2 marks)
 - iii) Fusing current (2 marks)
- b)
 - i) Draw a labelled diagram of an HBC fuse. (3 marks)
 - ii) What does the acronym HBC stand for. (1 mark)

QUESTION 4

- a) Explain the purpose of the following factors in cable size selection:
 - i) Grouping factor (2 marks)
 - ii) Ambient temperature factor (2 marks)
 - iii) Thermal insulation factor (2 marks)

- b) i) Define the term space factor as applied to cable enclosures. (2 marks)
ii) What is the space factor for conduits and for trunking. (2 marks)

QUESTION 5

- a) Define following terms applied to earthing:
Exposed conductive parts:
i) Extraneous conductive parts. (2 marks)
ii) Circuit protective conductors (2 marks)
- b) Use a labelled diagram illustrate a TT earthing system in a single phase circuit. (4 marks)

QUESTION 6

- a) Describe the following five (5) hazardous areas:
i) Zone 0 (2 marks)
ii) Zone 2 (2 marks)
iii) Zone 3 (2 marks)
- b) Draw a labelled diagram of an open circuit fire alarm system. (4 marks)

QUESTION 7

A work area at bench level is to be illuminated to a value of 300 lux, using 85W LED fittings having an efficacy of 80lm/w.

The work area is 10mx8m, the maintenance factor is 0,8 and the coefficient of utilisation is 0,6. Calculate the number of fittings required. (10 marks)

QUESTION 8

- a) By means of a diagram, explain the operation of Bucholz relay. (7 marks)
- b) State the three transformer oil tests. (3 marks)

QUESTION 9

- a) Name any three (3) methods of starting squirrel cage induction motors. (3 marks)
- b) A 3-phase induction motor has four poles and operates at a frequency of 50Hz. Calculate:
- i) The synchronous speed. (3 marks)
- ii) The slip if it runs at a rotor speed of 1440 r.p.m. (4 marks)

QUESTION 10

- a) Using a well labelled diagram, explain the construction of a dc machine. (5 marks)
- b) State the function of each part in (a) above. (5 marks)

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