



ZIMBABWE

MINISTRY OF HIGHER AND TERTIARY EDUCATION

HIGHER EDUCATION EXAMINATIONS COUNCIL  
(HEXCO)

NATIONAL CERTIFICATE

IN

DIESEL PLANT FITTING

SUBJECT: Technology

PAPER NO: 319/S01

**JUNE 2011 EXAMINATION**

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

- SECTION A: Answer ALL questions. Section carries 20 marks.
- SECTION B: Answer ALL questions. Section carries 20 marks.
- SECTION C: Answer Five (5) questions. Each question carries 12 marks.

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*This paper consists of 5 printed pages.*

**SECTION A**

QUESTION 1

- a) State the file used to repair damaged external threads. (1 mark)
- b) Define directional cooling. (1 mark)
- c) State the function of the differential. (1 mark)
- d) The ..... converts hydraulic fluid power into rotary mechanical energy while the..... crates fluid flow. (2 marks)
- e) State the type of governor which regulates fuel throughout the speed range of an engine. (1 mark)

QUESTION 2

- a) State how the battery electrolyte for a lead acid battery is prepared. (1 mark)
- b) Name the valve that prevents simultaneous application of the service brake and hand brake in pneumatic brake systems. (1 mark)
- c) State the types of injector nozzle fitted to an indirect injection diesel engine. (1 mark)
- d) State the type of fit for the small end fitted with a phosphor-bronze bush. (1 mark)
- e) To reduce turbulence in a torque converter, a ..... is fitted, and a ..... is mounted on the free wheel so that it re-directs oil. (2 marks)

QUESTION 3

- a) State the cause
  - i) rapid tyre wear at the centre (1 mark)
  - ii) rapid tyre wear on both shoulders (1 mark)
  - iii) rapid tyre wear on one shoulder (1 mark)
  - iv) feathered tread (1 mark)
- b) List three groups of valves in a hydraulic system (3 marks)
- c) State difference between pressure gauges and micrometers. (1 mark)

**SECTION B**

QUESTION 4

- a) State the function of
- i) centering grooves on a spool valve (2 marks)
  - ii) throttling slots on a spool valve. (2 marks)
- b) List two types of intercoolers used on turbo charged engines. (2 marks)
- c) State:
- i) The meaning of the abbreviations P.T.G used on Cummins fuel system. (1 marks)
  - ii) Two firing orders of a six cylinder engine. (2 marks)

QUESTION 5

- a) What is the difference between a balanced and a non-balanced vane pump? (2 marks)
- b) What do you understand by the term  $5/2$  way directional control valve? (2 marks)
- c) Define cavitation. (1 mark)

QUESTION 6

- a) State four advantages of turbo charging. (4 marks)
- b) Give two functions of check valves used in hydraulic brakes. (2 marks)

**SECTION C**

QUESTION 7

- a) Draw a bladder type accumulator and label. (6 marks)
- i) bladder (1 mark)
  - ii) gas (1 mark)
  - iii) protective button (1 mark)
  - iv) oil inlet orifice (1 mark)
  - v) oil (1 mark)
  - vi) gas charging valve (1 mark)

QUESTION 8

With the aid of two well labelled diagrams. Show the operation of the D.P.A hydraulic head during (5 marks)

- a) charging (5 marks)
- b) pumping (2 marks)

QUESTION 9

- a) Given the following information, construct the C I four stroke valve timing diagram. (9 marks)

inlet valve opens	12° B.T.D.C
inlet valve opening period	237°
exhaust valve opens	40° B. B. D.C
valve overlap	22°
injection begins	15°

- b) From the valve timing diagram calculate
- i) inlet valve lag period (1 mark)
  - ii) exhaust valve lag period (1 mark)
  - iii) exhaust valve opening period (1 mark)

QUESTION 10

- a) Draw a well labelled diagram of an orifice type cushioning device. (5 marks)
- b) What are the four advantages of using engine brakes? (4 marks)
- c) What are the three factors which affect braking efficiency? (3 marks)

QUESTION 11

- a) State functions of
- i) relay valve (1 mark)
  - ii) relay emergency valve (1 mark)
  - iii) dual foot valve (1 mark)
  - iv) tristop relay valve (1 mark)
  - v) quick release valve (1 mark)
  - vi) solenoid relay valve (1 mark)
- b) With reference to torque converters, define coupling phase. (2 marks)
- c) List two requirements of power assisted steering system. (2 marks)
- d) State the advantage of employing a tandem master cylinder over a single one. (2 marks)

QUESTION 12

- a) Draw a self excited alternator and label. (5 marks)
- i) charge warning light (1 mark)
  - ii) exciter diodes (1 mark)
  - iii) power diodes (1 mark)
  - iv) stator (1 mark)
  - v) rotor field (1 mark)
  - vi) one earth (1 mark)

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