higher education & training

Department:
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T450**(E)**(A7)T

NATIONAL CERTIFICATE

DIESEL TRADE THEORY N3

(11041823)

7 August 2019 (X-Paper)
09:00–12:00

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INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Sketches must be large, neat and fully labelled.
5. Write neatly and legibly.
6. Formulae: Cr = $\frac{Vs + Vc}{Vc}$; Vs = $\frac{\pi D^2 \times Ls}{4}$; η = 1 - $\left[\frac{1}{R}\right]^{0,4}$

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QUESTION 1

1.1 An engine has a clearance volume of 180 cm^3 and a cylinder diameter of 98 mm.

Determine the stroke length of the cylinder for a compression ratio of 15:1. (7)

1.2 Determine the air standard efficiency of the engine in QUESTION 1.1 (3)

1.3 Name FIVE mechanical changes which can be made to a compression ignition engine to improve its volumetric efficiency. (5)

1.4 Give TWO advantages and THREE disadvantages of an increased compression pressure on the efficiency of an engine. (5)
[20]

QUESTION 2

2.1 FIGURE 1 shows a side view of a silicon vibration damper used on a diesel engine.

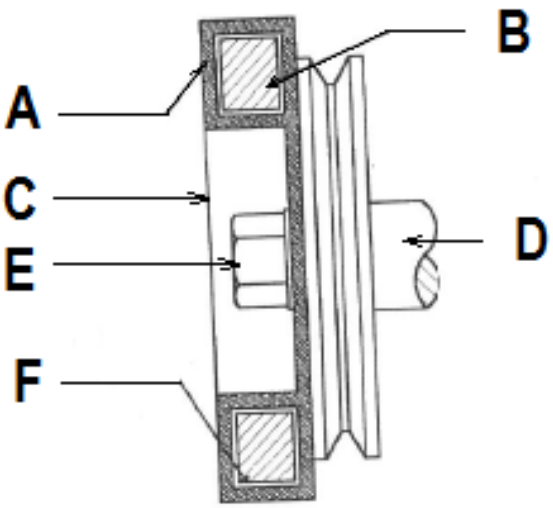

Figure 1

2.1.1 Identify the indicated parts by writing the answer next to the letter (A–F) in the ANSWER BOOK. (5)

2.1.2 Describe the operation of the vibration damper during acceleration and deceleration of the engine. (5)

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2.2 Illustrate with sketches, the difference between of the following crankshaft layouts.

2.2.1 Six-cylinder in-line engine (3)

2.2.2 Six-cylinder v- engine (3)

2.3 Make a neat line sketch to illustrate a W-head valve arrangement. (2)

2.4 Give TWO advantages of the W-Head valve arrangement, when compared to an I-head valve construction. (2)
[20]

QUESTION 3

3.1 Name FOUR differences in construction between a fluid flywheel and a torque converter. (4)

3.2 FIGURE 2 shows a sectional view of a limited slip differential.

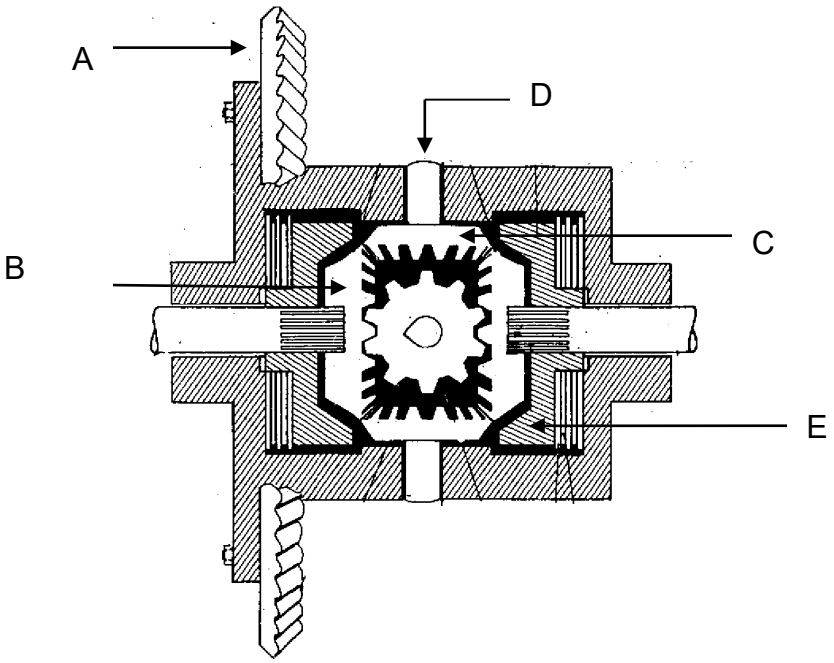

FIGURE 2

3.2.1 Identify the components by writing the answer next to the letter (A–E) in the ANSWER BOOK. (5)

3.2.2 Describe the operation of the differential in a vehicle, when cornering. (6)

3.3 State FIVE mechanical defects that could cause hard steering in a power steering system. (5)
[20]

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QUESTION 4

41 FIGURE 3 shows a sectional view of a mechanical governor.

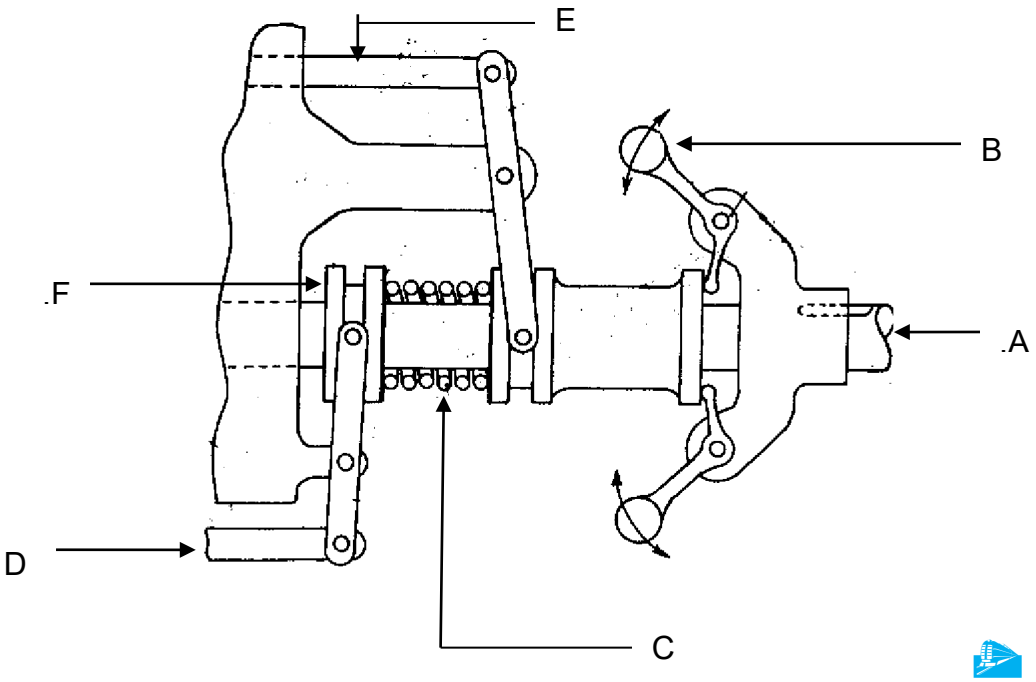

FIGURE 3

4.1.1 Identify the components by writing the answer next to the letter (A–F) in the ANSWER BOOK. (6)

4.1.2 Briefly describe the operation of the mechanical governor when the engine is under load. (6)

4.2 With the aid of a neat labelled sketches, illustrate the operation of the injection pump during the charging stroke (8)

[20]

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QUESTION 5

5.1 FIGURE 4 shows a s sketch of a workshop floor layout with different areas marked A–J.
Indicate in which are, you will place the departments listed below to ensure that the work flows smoothly and safety standard are maintained.

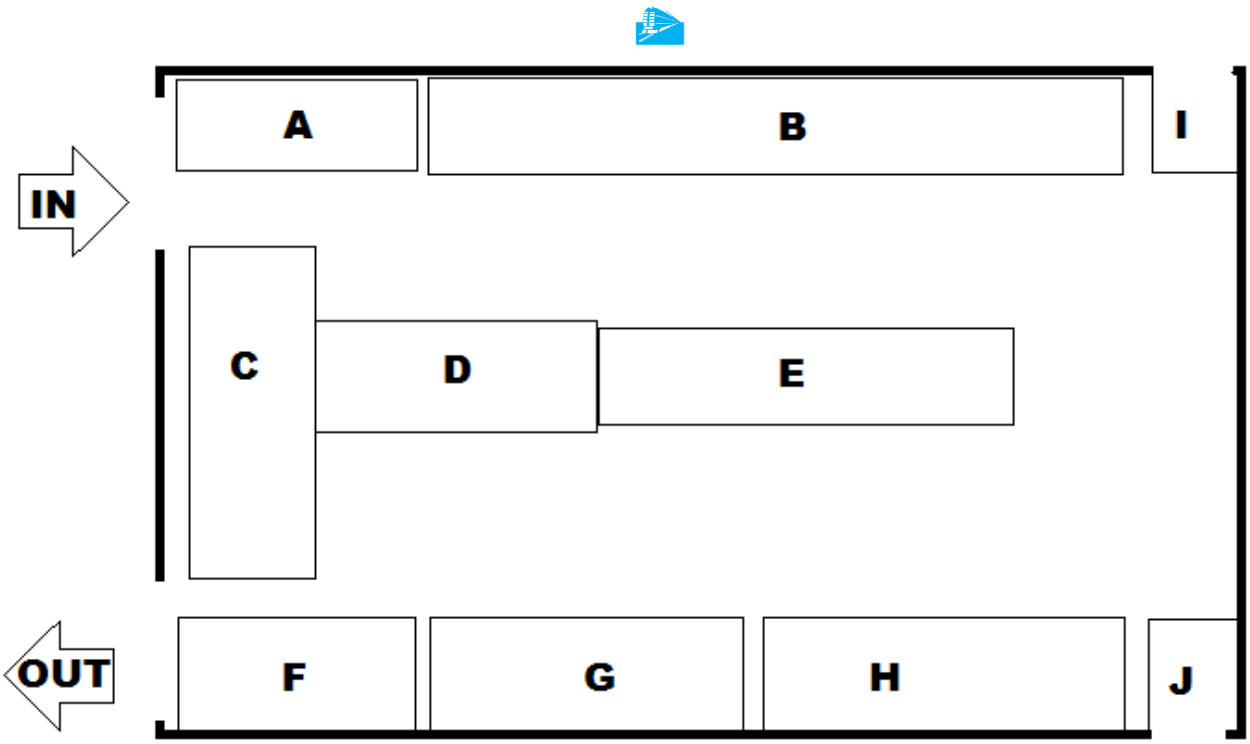

FIGURE 4

5.1.1 Emergency Exit

5.1.2 Carwash

5.1.3 Parts Department

5.1.4 Inspection area after completion of repiars

5.1.5 Reception Area

(5 × 1) (5)

5.2 State FIVE requirements an apprentice must satisfy during a job interview. (5)

5.3 Briefly explain how the original and copies of a FIVE-part job card are distributed in a motor workshop. (5)

5.4 Name THREE advantages and TWO disadvantages of having a diagnostic centre at a garage. (5)

[20]

TOTAL: 100

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