

**Методичні вказівки**  
**до виконання самостійних робіт**  
**«English for Automotive Engineering Students. Part II»**  
**для студентів спеціальностей**  
**274 «Автомобільний транспорт»,**  
**275 «Транспортні технології»**



Міністерство освіти і науки України  
Вінницький національний технічний університет

**Методичні вказівки**  
**до виконання самостійних робіт**  
**«English for Automotive Engineering Students. Part II»**  
**для студентів спеціальностей**  
**274 «Автомобільний транспорт»,**  
**275 «Транспортні технології»**

Вінниця  
ВНТУ  
2024

Рекомендовано до видання Радою з якості освіти Вінницького національного технічного університету Міністерства освіти і науки України (протокол № 7 від 22.02.2024 р.)

Рецензенти:

**О. В. Столяренко**, кандидат педагогічних наук, доцент

**С. О. Романюк**, кандидат технічних наук, доцент

Методичні вказівки до виконання самостійних робіт «English for Automotive Engineering Students. Part II» для студентів спеціальностей 274 «Автомобільний транспорт», 275 «Транспортні технології» [Електронний ресурс] / Уклад. Т. Г. Рудницька, А. А. Слободянюк. – Вінниця : ВНТУ, 2024. – 49 с.

Методичні вказівки містять науково-технічні тексти і комплекс завдань з лексико-граматичними і граматичними вправами до виконання самостійних робіт з дисципліни «Іноземна мова за професійним спрямуванням» та рекомендовану літературу. Методичні вказівки розроблено відповідно до робочої програми навчальної дисципліни «Іноземна мова за професійним спрямуванням» для студентів спеціальностей 274 «Автомобільний транспорт», 275 «Транспортні технології».

# CONTENTS

<b>Unit 1.</b> .....	4
Topic: Internal Combustion Engine.	
Vocabulary Practice: Commercial Vehicles. Sedans Features. Luxury and Sport Cars Types.	
Applied Grammar: Non-Finite Forms of the Verb: Infinitive, Gerund, Participle. Prepositions. Grammar Review.	
<b>Unit 2.</b> .....	16
Topic: Ignition System.	
Vocabulary Practice: Trucks and Vans Features. Family Car Advantages.	
Applied Grammar: Infinitive and Gerund Constructions. Adjectives and Adverbs. Prepositions.	
<b>Unit 3.</b> .....	25
Topic: Power Steering System	
Vocabulary Practice: Vehicle Electrical System Parts and Functions.	
Applied Grammar: Types of Conditionals. Conditional I.	
<b>Unit 4.</b> .....	36
Topic: Braking System.	
Vocabulary Practice: Common Types and Components of Car Braking System.	
Applied Grammar: Conditional II. Conditional III.	
<b>References.</b> .....	48

# UNIT 1

**Topic: Internal Combustion Engine.**

**Vocabulary Practice: Commercial Vehicles. Sedans Features. Luxury and Sport Cars Types.**

**Applied Grammar: Non-Finite Forms of the Verb: Infinitive, Gerund, Participle. Prepositions.**

**Grammar Review.**

## *Exercise 1.*

*Before reading the text about internal combustion engine let's discuss the following questions.*

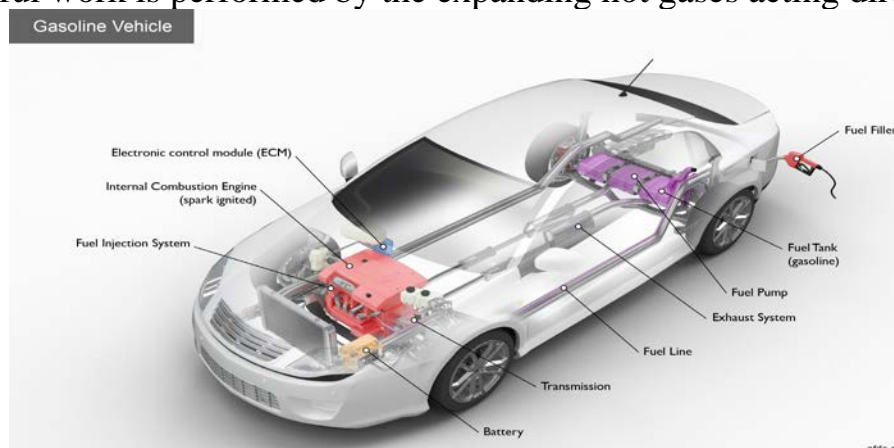
1. Name some parts of internal combustion engine located in the engine block.
2. What kinds of fuel do internal combustion engines use?
3. What are the phases of a four-stroke cycle?

## *Exercise 2.*

*Read and translate the following text into Ukrainian.*

### **Internal Combustion Engine**

The internal combustion engine is a heat engine in which the burning of a fuel occurs in a confined space called a combustion chamber. This exothermic reaction of a fuel with an oxidizer forms gases of high temperature and pressure to be expanded. The striking feature of an internal combustion engine is that useful work is performed by the expanding hot gases acting directly to cause



movement, for example by acting on pistons, rotors, or even by pressing on and moving the entire engine itself.

This contrasts with external combustion engines such as steam engines which use the combustion process to heat a separate working fluid. Typically water or steam, performing the operation by pressing on a steam actuated piston.

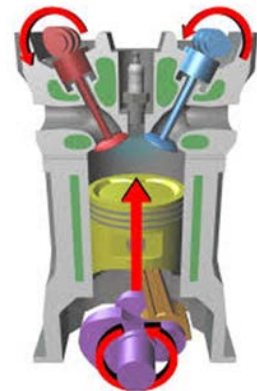
All internal combustion engines depend on the exothermic chemical process

of combustion that is the reaction of a fuel with air and other oxidizers such as nitrous oxide.

The most common fuel in use today are made up of hydrocarbons and are derived from petroleum. These include the fuels known as diesel, gasoline and liquified petroleum gas. Most internal combustion engines designed for gasoline can run on natural gas or liquified petroleum gases without modifications except for the fuel delivery components. There can be used liquid and gaseous biofuels, such as ethanol and hydrogen.

All internal combustion engines must have a means of ignition to promote combustion. Most engines use either an electrical or a compression heating ignition system. Electrical ignition systems generally rely on a lead-acid battery and an induction coil to provide a high voltage electrical spark to ignite the air-fuel mix in the engine's cylinders. This battery can be recharged during operation using an electricity-generating device, such as an alternator, driven by the engine. Compression heating ignition systems, such as diesel engines and NCO engines, rely on the heat created in the air by compression in the engine's cylinders to ignite the fuel.

The combustion products and hot gases, being successfully ignited and burnt, have more available energy than the original compressed fuel-air mixture (which had higher chemical energy). The available energy transforms into high temperature and pressure to be translated into work by the engine. In a reciprocating engine, the high pressure product gases inside the cylinders drive the engine's pistons.



Once the available energy has been removed the remaining hot gases are vented and this allows the piston to return to its previous position (Top Dead Center – TDC). The piston can then proceed to the next phase of its cycle, being different in engines. Any heat then is thought to be a waste product, and is removed from the engine either by an air or liquid cooling system.

The parts of an engine vary depending on the engine's type. For a four-stroke engine, key parts of the engine include the crankshaft (purple), one or more camshafts (red and blue) and valves. For a two-stroke engine, there may simply be an exhaust outlet and fuel inlet instead of a valve system. In both types of engines, there are one or more cylinders (grey and green) and for each cylinder there is a spark plug (dark grey), a piston (yellow) and a crank (purple). A single sweep of the cylinder by the piston in an upward or downward motion is called a stroke and the downward stroke that occurs directly after the air-fuel mix in the cylinder ignition is a power stroke.

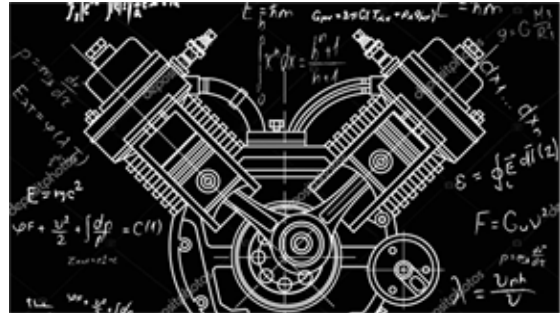
Internal combustion engines are often used for mobile propulsion systems. In mobile scenarios internal combustion is advantageous, since it can provide high power to weight ratios together with excellent fuel energy-density. These engines have appeared in almost all automobiles, motorbikes, many boats, and

in a wide variety of aircraft and locomotives. In jet aircraft, helicopters and large ships, with very high power required, they are in the form of gas turbines. Internal combustion engines are also used for electric generators and by industry.

### ***Exercise 3.***

***Answer the following questions.***

1. How can one define the term «internal combustion engine»?
2. What is the defining feature of an internal combustion engine?
3. Do all internal combustion engines depend on the exothermic chemical process of combustion?
4. How do external combustion engines such as steam engines use the combustion process?
5. What kind of battery do electrical ignition systems generally rely on?
6. Name the most common fuel in use today.
7. Do the combustion products once successfully ignited and burnt have more available energy than the original compressed fuel mixture?
8. How do the parts of an engine vary?
9. What are the key parts of the four-stroke engine stroke engine?
10. Internal combustion engines are most commonly used for mobile propulsion systems, aren't they?
11. What power can internal combustion provide?
12. Are internal combustion engines also used for electric generators and by industry?



### ***Exercise 4.***

***Read the text in exercise 2 and decide whether the following statements are true (T) or false (F). Correct the false ones.***

1. The internal combustion engine is a heat engine in which the burning of a fuel occurs in a confined space called a combustion chamber.
2. The defining feature of an internal combustion engine is that useful work is performed by the expanding cold gases acting directly to cause movement.
3. All internal combustion engines depend on the exothermic chemical process of combustion.
4. The most common fuel in use today is diesel, gasoline and liquified petroleum gas.
5. All internal combustion engines must have a means of ignition to stop combustion.

6. Compression heating ignition systems, such as diesel engines and NCO engines, rely on the heat created in the air by compression in the engine's cylinders to ignite the fuel.

7. The available energy is manifested as low temperature and pressure which can be translated into work by the engine.

8. The parts of an engine vary depending on the engine's type.

9. A single sweep of the cylinder by the piston in an upward or downward motion is called a stroke and the downward stroke that occurs directly after the air-fuel mix in the cylinder ignition is a power stroke.

10. Internal combustion engines are most commonly used for mobile propulsion systems.

***Exercise 5.***

***Read the following text and make up 6 different questions. Think about the title of the webpage.***

Open Road Transport is committed to serving your commercial vehicle needs. Our light commercial vehicle line is our most full efficient. Our heavy commercial vehicles feature maximum storage capabilities. Choose the best fit for you shipping operations. Open Road Transport also serves public transport departments. Our bus lines accommodate passengers was comfort and style. These fleets provide mass transit to many metropolitan areas. Take a moment to search out the different vehicles we offer for sale. You can search models by gross vehicles weight ratings, class, or price.

***Exercise 6.***

***Before you read the following text look at the title and make predictions about what you expect the text to be about. Read and translate the text into Ukrainian.***

**More Features and Better Quality**

Lux Motor's prestige is result of our quality vehicles. We make the finest luxury vehicles in the world. We also make the best high-performance sports cars. These range from affordable pony cars to high-end supercars. Most of our vehicles feature the best acceleration in class. We also offer stylish looks. Just because we make fast muscle cars it does not mean that we sacrifice features.



Auto Magazine voted our grand tourer for best interior design. Our roadsters and convertibles open and close at the touch of a button. The new sedan comes in two body styles: the hatchback and the coupe. The hatchback has more cargo

space. This is because of its four-box design. The pillar in the rear is four feet behind the C pillar. The roof line slants down to the rear, looking much like fastbacks of years past.



The coupe is smaller, but very sporty. Unlike the four-door hatchback, the coupe has a two-door design. It seats three people. It also features a manual transmission.

**Exercise 7.**

**Sort out the words from the text into two categories:**

Luxury Vehicles	Sedans

**Exercise 8.**

**Complete the sentences using the infinitive or the gerund of the verbs in brackets.**

1. I need (study) tonight.
2. I enjoy (drive) a car.
3. Ellen started (talk) her problem.
4. Bob and Sally have decided (start) their business.
5. We finished (work) around six.
6. Are you planning (take) a vacation this year?
7. I like (meet) new people.
8. The students went (camp) in the mountains last summer.
9. My groupmate offered (help) me with my English.
10. I want (go) (shop) this afternoon.
11. Alan seems (want) (go) (sail) this weekend. Did you remember (check) the windshield for cracks this morning?
12. I won't be late. I promise (be) on time.
13. I'm considering (move) to a new apartment.
14. What time do you expect (arrive) in Lviv?
15. Some learners hate (drill).
16. I forgot (lock) the door when I left my office this evening.
17. I don't mind (upgrade) my sedan.

18. Don't put off (inspect) your hatchback until the last minute.
19. Ken had to quit (jog) because he hurt his knee.
20. The company will continue (hire) new employees as long as new production orders keep (come) in.
21. That's not what I meant! I meant (say) just the opposite.

**Exercise 9.**

**Complete the sentences using prepositions and the gerund.**

Example: Ben interrupted me. He apologized for that. – Ben apologized for interrupting me.

1. I like to learn about other countries and cultures. I'm interested ..... that. – I'm interested ..... about other countries and cultures.
2. I helped Alan. He thanked me ..... that. – Alan thanked me ..... him.
3. Jane wanted to walk to work. She ..... that. – We offered Jane a ride but she insisted ..... to work.
4. My brother lost my car keys. I forgave him ..... that. – I forgave my brother ..... my car keys when he borrowed my car.
5. Sue wanted to go to a movie, but James didn't want to. They argued ..... that. – Sue and James argued ..... to a movie.
6. James cuts his own hair. Instead ..... that, he should go to a barber. – Instead ..... his own hair, James should go to a barber.
7. Mr. and Mrs. Brown have always saved for a rainy day. They believe ..... that. – Mr. and Mrs. Brown believe ..... for a rainy day.
8. I may fall on the steps and make a fool of myself. I'm worried ..... that. – I'm worried ..... on the steps and a fool of myself when I walk in the hall to receive my driving license.
9. The children are going to go to the seaside. They're excited ..... that. – The children are excited ..... to the seaside.
10. Their parents are going to the seaside ..... too. They are looking forward ..... that. – Their parents are looking forward ..... there, too.

**Exercise 10.**

**Put in the missing prepositions.**

1. The strategy has been adopted but nobody knows the reason ..... this.
2. Don't ask me to sign this. I'm not very good ..... solving the problems.
3. The students say that Sally is arrogant but she's always very nice ..... me.
4. What do you think is the best idea ..... this situation?
5. There has been a significant decrease ..... the price of fuel recently.
6. Henry does car repair himself. He doesn't have much contact ..... other mechanics.

7. Polly likes travelling. She likes taking pictures ..... people.
8. George got married ..... a woman he met when he was working abroad
9. He's very confident. He's not afraid ..... anything.
10. I'm surprised ..... the amount of traffic today. I didn't think it would be so busy.
11. Thank you for helping me with this text. It was full ..... useful information.
12. You are welcome. I'm sorry ..... the mess.
13. She works quite hard. You can't accuse her ..... being lazy.
14. Who's going to look ..... your children while you're at work?
15. The problem is becoming serious. We have to do something .....it.
16. I prefer this chair ..... the other one. It's more comfortable.
17. I must phone ..... the department to tell them I won't be at work today.
18. The river divides the city ..... two parts.
19. What do you think ..... the new manager? – She's all right, I suppose.
20. Can you explain ..... me what have to do?
21. You remind me ..... somebody I knew a long time ago.
22. What's funny? What are you laughing .....?
23. What have you done with all the money you had? What did you spend it .....?

### ***Exercise 11.***

***Complete the sentences choosing the correct grammar form.***

1. *Have you been waiting \_\_\_\_\_ a long time?*

- a) when;
- b) from;
- c) for;
- d) too.

2. *Do you enjoy \_\_\_\_\_ the movie?*

- a) watching to;
- b) to watch to;
- c) watching;
- d) to watch.

3. *My boss won't \_\_\_\_\_ change the design.*

- a) to let me to;
- b) let me;
- c) to let me;
- d) letting me to.

4. *Unless you \_\_\_\_\_ harder, you could not be promoted.*

- a) will work;

- b) will to work;
- c) worked;
- d) work.

5. *How long \_\_\_\_\_ car options?*

- a) have you describing;
- b) are you describing;
- c) have you been describing;
- d) do you describe.

6. *I \_\_\_\_\_ to stop very quickly in order to avoid hitting the car in front of me.*

- a) must;
- b) should;
- c) had to;
- d) can.

7. *Sally studies English \_\_\_\_\_ a language school.*

- a) at;
- b) with;
- c) for;
- d) from.

8. *If you \_\_\_\_\_ he was applying for the job, why didn't you inform me?*

- a) had known;
- b) knew;
- c) has known;
- d) was knowing.

9. *Don't panic! It was so long ago I'm sure he won't remember \_\_\_\_\_ you to do it.*

- a) to have told;
- b) to tell;
- c) to telling;
- d) having told.

10. *Henry is so impudent! There's \_\_\_\_\_ hope that he will ever cooperate with his partners while he's abroad.*

- a) little;
- b) a little;
- c) a few;
- d) few.

11. \_\_\_\_\_ the cracked windshield \_\_\_\_\_ caused a great problem.

- a) It was/what;
- b) It was/that;
- c) This is/what;
- d) These are/that.

12. Students liked the teacher for his \_\_\_\_\_ personality.

- a) kind and quite;
- b) quiet and kind;
- c) quiet and kind;
- d) quite.

13. \_\_\_\_\_ that you tell us everything, you won't be punished.

- a) If;
- b) Provided;
- c) If only;
- d) After.

14. Sondra looks so aggressive! She \_\_\_\_\_ heard what you said about her.

- a) must have;
- b) must;
- c) can have;
- d) can has had.

15. I \_\_\_\_\_ the office when the accident happened.

- a) was driven;
- b) was being drive;
- c) driving;
- d) was driving.

16. Take your umbrella \_\_\_\_\_ it rains.

- a) in case;
- b) for the case;
- c) since;
- d) for.

17. The son doesn't take \_\_\_\_\_ his father at all.

- a) after;
- b) over;
- c) up;
- d) with.

18. A burglar broke \_\_\_\_\_ our house last night.

- a) out of;
- b) into;
- c) out;
- d) in.

19. Sorry, I can't give you my test. I tried \_\_\_\_\_ it but it was too difficult.

- a) do;
- b) to do;
- c) doing;
- d) to have done.

20. I \_\_\_\_\_ by a professional barber two days ago.

- a) have cut my hair;
- b) had my hair cut;
- c) cut my hair;
- d) had cut my hair.

21. The guests didn't know about the accident until the next day because when it happened they \_\_\_\_\_ the party.

- a) have left;
- b) had already left;
- c) left;
- d) were about to leave.

22. You look tired! What \_\_\_\_\_?

- a) have you do;
- b) did you do;
- c) had you done;
- d) have you been doing.

23. Can you tell me \_\_\_\_\_ the Royal Hotel please?

- a) the path to;
- b) the way for;
- c) the way to;
- d) the pavement to.

24. I wish I \_\_\_\_\_ to my teachers when they told me to study harder, then I would have passed the exam.

- a) had listened;
- b) have listened;
- c) listened;
- d) was listening.

25. I find it difficult to come \_\_\_\_\_ new ideas.

- a) up with;
- b) over with;
- c) across with;
- d) through with.

26. \_\_\_\_\_ the fact that he got the best results in the test he was not promoted.

- a) Despite of;
- b) Even though;
- c) In spite of;
- d) Although.

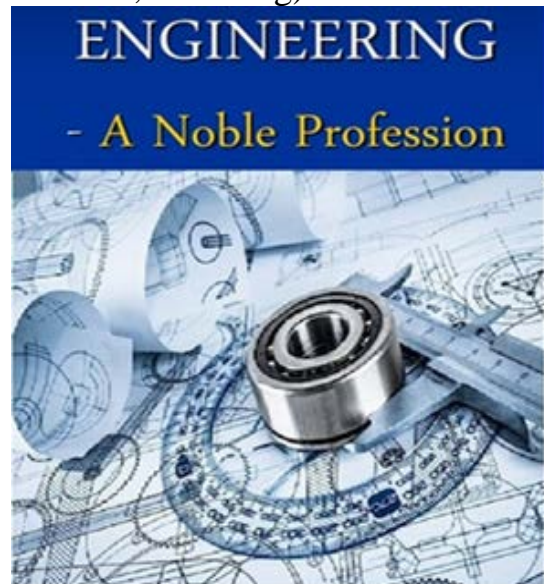
27. If only he had managed \_\_\_\_\_ Jim last week.

- a) getting in touch with;
- b) to get in touch with;
- c) get in touch with;
- d) got in touch with.

### **Exercise 12.**

**Read the text about The Engineering Profession and complete the sentences choosing the correct form of participle.**

Engineering is one of the most ancient occupations in the world history. Without the skills 1) ..... (having included, included, including) in the broad field of engineering, the modern civilization never could have evolved. The first toolmakers who 2) ..... (being chipped, chipped, having been chipped) arrows and spears from rock were the forerunners of mechanical engineers. The craftsmen who discovered metals in the earth and found ways to refine and use them were the ancestors of mining and metallurgical engineers. And the skilled technicians who 3) ..... (being devised, devised) irrigation systems and erected the beautiful buildings of the ancient world were the civil engineers of their time.



Engineering is often described as 4) ..... (making, having been made, being made) practical application of theoretical sciences such as physics and mathematics. Many of the early branches of engineering were based not on science but on empirical information that 5) ..... (depended, being

depended) on observation and experience.

The Industrial Revolution began in the 18<sup>th</sup> century. First steam engines and then other kinds of machines took over more and more of the work that 6) ..... (doing, having done, had previously been done) by human beings or by animals. James Watt, one of the key figures in the early development of steam engines, created the concept of horse power to make his customers understand the amount of work his machines could perform.

Since the 19<sup>th</sup> century both scientific research and practical application results have evolved. The Industrial Revolution began by putting water and steam to work; since then machines 7) ..... (being used, using, having been used) electricity, gasoline, and other energy sources have become widespread and very popular in the world.

## UNIT 2

**Topic: Ignition System.**

**Vocabulary Practice: Trucks and Vans Features. Family Car Advantages.**

**Applied Grammar: Infinitive and Gerund Constructions. Adjectives and Adverbs. Prepositions.**

*Exercise 1.*

*Before reading the text about electronic ignition system let's discuss the following questions.*

1. Name the basic car systems.
2. What system do most engines use for ignition today?
3. When did digital electronic ignition modules become available for small engines?

*Exercise 2.*

*Read and translate the following text into Ukrainian.*

### Electronic Ignition

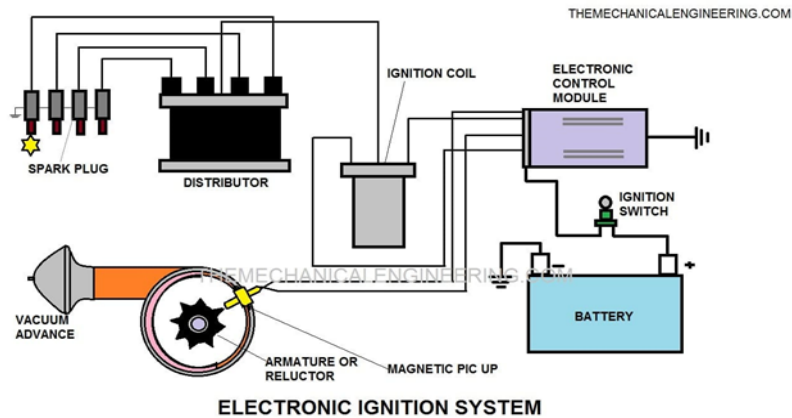
Internal combustion engines can be classified by their ignition system. The point in the cycle at which the fuel/oxidizer mixture is ignited has a direct effect on the efficiency and output of the ICE. For a typical 4 stroke automobile engine, the burning mixture has to reach its maximum pressure when the crankshaft is 90 degrees after TDC. The speed of the flame front is directly influenced by compression ratio, fuel mixture temperature and octane or cetane rating of the fuel. Modern ignition systems are designed to ignite the mixture at the right time to ensure the flame front doesn't contact the descending piston crown. If the flame front contacts the piston, pinking or knocking results. Leaner mixtures and lower mixture pressures burn more slowly requiring more advanced ignition timing. Today most engines use an electrical or compression heating system for ignition.

The disadvantage of the mechanical system is thought to be the use of breaker points to interrupt the low voltage high current through the primary winding of the coil. The points are subject to mechanical wear where they reach the cam to open and shut. They can suffer oxidation and burning at the contact surfaces from the constant sparking. Regular adjustment to compensate for wear is required. The opening of the contact breakers responsible for spark timing is subject to mechanical variations.

The spark voltage being dependent on contact effectiveness poor sparking can lead to lower engine efficiency. A mechanical contact breaker system cannot

control an average ignition current of more than about 3 A while still giving a reasonable service life, and this may limit the power of the spark and ultimate engine speed.

Electronic ignition is believed to solve these problems. In the initial systems, points still being used only handled a low current which was used to control the high primary current through a solid state switching system.



Soon these contact breaker points were replaced by an angular sensor of some kind – either optical, where a vaned rotor breaks a light beam, or more commonly using a Hall effect sensor, which responds to a rotating magnet mounted on a suitable shaft. The sensor output is shaped and processed by suitable circuitry, then used to trigger a switching device such as a thyristor, which switches a large current through the coil.



The rest of the system (distributor and spark plugs) remains as for the mechanical system. The lack of moving parts compared with the mechanical system leads to greater reliability and longer service intervals. For older cars, it is usually possible to retrofit an electronic

ignition system in place of the mechanical one. In some cases, a modern distributor will fit into the older engine with no other modifications.

Other innovations are currently available on various cars. In some models there can be found individual coils on each spark plug. This allows the coil a longer time to accumulate a charge between sparks, and therefore a higher energy spark. Each coil handle two plugs with variation on cylinders which are 360 degrees out of phase. The four-cycle engine suggests that one plug will be sparking during the end of the exhaust stroke while the other fires at the usual time, a so-called «wasted spark» arrangement which has no drawbacks apart from faster spark plug erosion. The paired cylinders are 1/4 and 2/3. Other systems do away with the distributor as a timing apparatus and use a magnetic crank angle sensor mounted on the crankshaft to trigger the ignition at the proper time.

During the 1980s electronic ignition systems were developed alongside other improvements such as fuel injection systems. After a while it became logical to combine the functions of fuel control and ignition into one electronic

system known as an engine control unit.

At the turn of the century digital electronic ignition modules became available for small engines on such applications as chainsaws, string-trimmers, leaf blowers, and lawn mowers. This was made possible by low cost, high speed and small footprint microcontrollers. Digital



electronic ignition modules can be designed as either capacitive discharge or inductive discharge ignitions. Capacitive discharge digital ignitions store charged energy for the spark in a capacitor within the module that can be released to the spark plug at virtually any time throughout the engine cycle via a control signal from the microprocessor. This allows for greater timing flexibility, and engine performance, especially when designed hand-in-hand with the engine carburetor.

### ***Exercise 3.***

***Answer the following questions.***

1. How can one define the term «electronic ignition»?
2. What is the disadvantage of the mechanical system?
3. What can poor sparking lead to?
4. Can a mechanical contact breaker system control an average ignition current giving a reasonable service life?
5. How does electronic ignition solve these problems?
6. Do distributor and spark plugs remain as for the mechanical system?
7. Is it possible to retrofit an electronic ignition system in place of the mechanical one for older cars?
8. Will a modern distributor fit into the older engine with no other modifications?
9. What innovations are currently available on various cars?
10. What is digital electronic ignition?
11. How can digital electronic ignition modules be designed?
12. What are the advantages of capacitive discharge digital ignitions?

### ***Exercise 4.***

***Read the text «Electronic Ignition» in exercise 3 and decide whether the following statements are true (T) or false (F). Correct the false ones.***

1. The advantage of the mechanical system is the use of breaker points to interrupt the low voltage high current through the primary winding of the coil.
2. The spark voltage is dependent on contact effectiveness and poor sparking can lead to lower engine efficiency.
3. The sensor output is shaped and processed by suitable circuitry.

4. The presence of moving parts compared with the mechanical system leads to greater reliability and longer service intervals.

5. For older cars, it is usually possible to retrofit an EI system in place of the mechanical one.

6. At the turn of the century digital electronic ignition modules became available for small engines on such applications as chainsaws, string-trimmers, leaf blowers, and lawn mowers.

7. This was made possible by high cost, low speed, and small footprint microcontrollers.

8. Capacitive discharge digital ignitions store charged energy for the spark in a capacitor within the module that can be released to the spark plug at virtually any time throughout the engine cycle via a control signal from the microprocessor.

### ***Exercise 5.***

***Before you read the following text look at the title and make predictions about what you expect the text to be about. Read and translate the text into Ukrainian.***

## **Manufacturer Options**

We have some new options for trucks and vans. New models of pickup trucks will be available.

We will now carry two larger size trucks: full-size pickups and heavy duty pickups. These two new models come with either a standard bed or a long bed. The heavy duty pickups will also have towing capacity. The cab in both of these new models will be deluxe. The new mini pickup truck is only available on special order.



A new multi-passenger minivan is also coming. These minivans will all come with standard automatic locks and windows. Please make note of these new changes.

### ***Exercise 6.***

***Match the words from column A with their Ukrainian equivalents from column B.***

<b>A</b>	<b>B</b>
1. Side mirror	A) ходова частина
2. Hood	B) дальнє свїтло
3. Headlight	C) крило

4. Door	D) ковпак
5. Bumper	E) люк
6. Brake light	F) колеса
7. Windshield	G) лобове скло
8. Tail light	H) бічна панель
9. High beams	I) транспортний засіб
10. Fender	J) поворотник
11. Blinker	K) задні фари
12. Side panel	L) стоп сигнал
13. Wheels	M) бампер
14. Hubcap	N) супорти, колодки
15. Undercarriage	O) капот
16. Sunroof	P) передня фара
17. Vehicle	Q) дискові гальма
18. Brake system	R) авто з закритим кузовом
19. Calipers	S) двері
20. Hatchback	T) дзеркало бокового виду
21. Disc brakes	U) 4х-місний автомобіль
22. Sedan	V) гальмівна система

**Exercise 7.**

**Read the following text and make up 12 different questions.**

**Popular Cars for Families**

Compact car sales in urban areas increased. In metropolitan areas, compact cars (C-segment) are popular. They are easy to park on busy city streets. They don't take up too much space on crowded roads.

Also, they are easier to drive. Subcompact cars also sold well in urban and suburban areas. In suburban areas, subcompacts (or superminis) are popular for weekend drivers. Mid-size cars sold much better in suburban areas than in urban areas. More families want a larger



car like this. The greater cargo area makes them very desirable. For all vehicles were must continue to target sales to customers' needs.



Station wagons are still popular options for families. With a tailgate in the back, they offer extra space. SUVs are a great choice for large families. Most can comfortably seat eight passengers. Some models even have

third row seating for extra space. Do you need room for equipment or you pet? Add a cargo barrier for safer transport of these items. These powerful 4x4 vehicles offer off-road driving capability. For a mix of car plus SUV, look into a crossover, which also offers four-wheel drive.

**Exercise 8.**

**Sort out the words from the text into two categories:**

<i>Compact Car Features</i>	<i>Station Wagon Features</i>

**Exercise 9.**

**Complete the sentences using the infinitive or the gerund of the verbs in brackets.**

1. Clare intends (go) to the college next year.
2. Peter can't afford (buy) a new car.
3. Jane is thinking about (look) for a new job.
4. The manager refused (give) me a raise, so I quit.
5. My brother continued (read) his book even though the cars were making a lot of noise in the street.
6. Mike is trying (design) a new model.
7. Daniel hopes (have) many friends.
8. Eric decided (meet) the partners at the station at seven.
9. Have you discussed (change) your major with your academic advisor?
10. I haven't heard from Samuel for a long time. I keep (hope) that I'll get a letter from her soon.
11. Our groupmate can't stand (sleep) in a room with all of the windows closed.
12. Sam's car repair always failed. Finally he quit (try) (repair) autos in his garage.
13. Would you like (go) (dance) tonight?
14. The engineers talked about (build) a new house.
15. My friend offered (take) me to the railway station.
16. I'm planning (go) (shop) next week.
17. Would you mind (pass) this note to the teacher?
18. Tom expects (go) (fish) this weekend.
19. When Ted broke the window, he started (cry).
20. Jimmy likes (go) to professional conferences.
21. Would you like (go) to Sue's house next Sunday?

22. I expect (be) in class at seven.
23. I enjoy (drive).
24. I enjoy (be) a driver.

**Exercise 10.**

**Complete the sentences using «by» and the gerund of the verbs from the word-box.**

*Drink, guess, grow, smile, write, wag, wash, watch, wave, eat.*

*Example: Students practise English by writing compositions.*

1. We clean our clothes ..... them in washing machine.
2. I save money on food ..... my own vegetables.
3. You can improve your English ..... a lot of videos.
4. Children show other people they are happy .....
5. We satisfy our hunger ..... something.
6. We quench our thirst ..... something.
7. Ian figured out what bumper means .....
8. Alan caught my attention ..... his arms in the air.
9. My dog shows me he is happy ..... his tail.

**Exercise 11.**

**Complete the following sentences choosing the correct grammar structure.**

1. *Jane doesn't enjoy her job. She's ..... because she does same things every day.*

- a) boring;
- b) bored.

2. *The man was carrying a ..... suitcase.*

- a) black big plastic;
- b) big and black plastic;
- c) big black plastic;
- d) plastic big black.

3. *Mary's French is excellent. She speaks .....*

- a) perfectly French;
- b) French perfectly;
- c) perfect French;

d) French perfect.

4. *Henry ..... to find a job but he was not lucky.*

- a) tried hard;
- b) tried hardly;
- c) hardly tried.

5. *I haven't seen him for.....*

- a) such long;
- b) so long time;
- c) a such long time;
- d) such a long time.

6. *I haven't got ..... on holiday at the moment.*

- a) time enough to go;
- b) enough time to go;
- c) time enough for going;
- d) enough time for going.

7. *Linda will go there by bus. It's ..... to walk.*

- a) a quite long way;
- b) quite a long way;
- c) rather a long way.

8. *The test was quite easy – ..... we thought.*

- a) more easy that;
- b) more easy than;
- c) easier than;
- d) easier as.

9. *The more fuel you use .....*

- a) your expenses will be higher;
- d) will be higher your expenses;
- c) the higher your expenses will be.

10. *He's a fast driver. I can't drive as fast as.....*

- a) he;
- b) him;
- c) he can.

11. *The film was really interesting. It was ..... I've ever seen.*

- a) most interesting film;
- b) the more interesting film;

- c) the film more interesting;
- d) the most interesting film.

12. .... a long time for the bus.

- a) Always they have to wait;
- b) They always have to wait;
- c) They have always to wait;
- d) They have to wait always.

13. Ann ..... She left last month.

- a) still doesn't work here;
- b) doesn't still work here;
- c) no more works here;
- d) doesn't work here any more.

14. .... he can't drive, he has bought a new car.

- a) Why;
- b) Even though;
- c) If;
- d) When.

### **Exercise 12.**

**Put in the missing prepositions.**

1. I'd like to visit every country ..... the world.
2. Have you read any records ..... Rudolf Diesel? – No, I've never heard of him.
3. Is there a service centre near here? – Yes, there's one ..... the end of this road.
4. Tom is away at the moment. He's ..... busy.
5. You've got dim tail lights. Have a look ..... the mirror.
6. They went ..... a party ..... Lora's house on Sunday.
7. The village is ..... the west coast of island.
8. Enjoy the leaves ..... that tree.
9. Have you ever been ..... Paris? – No, I've never been ..... France.
10. We went ..... the cinema last night. We had seats ..... the front row.
11. Where's the light switch? – It's ..... the wall ..... the door.
12. What time did you arrive ..... the party?
13. I couldn't decide where to go. There was nothing ..... the tour list that I liked.
14. They live ..... a new block of flats. Their flat is ..... the fifth floor.

## UNIT 3

**Topic: Power Steering System.**

**Vocabulary Practice: Vehicle Electrical System Parts and Functions.**

**Applied Grammar: Types of Conditionals. Conditional I.**

*Exercise 1.*

*Before reading the text below try to answer the following questions.*

1. How does the driver control the direction of the car?
2. What connects the driver's steering wheel to the front wheels?
3. What allows the front wheels to turn left and right?
4. What are the key components of a manual steering system?
5. What are the different types of manual steering gears, and how do they work?

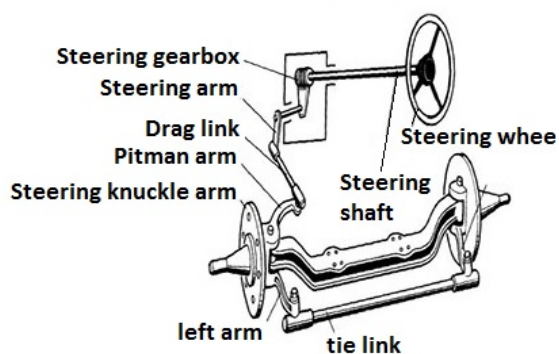
*Exercise 2.*

*Read and translate the following text into Ukrainian.*

### Power Steering System

Steering is the group of components and linkages, which allows any automobile to follow the desired course. The purpose of steering system is to allow the driver to guide the car. Each car has a steering gear, which is used for controlling the direction by turning usually front wheels of an automobile.

#### Steering system



The steering system is worm gear or screw gear, and rack and pinion or steering box intended to convert the rotation of the steering wheel into a movement of the road wheels. The steering system also provides a driver to use light force to steer a heavy car. The steering effort transmits to the wheels through a system of pivoted joints.

The car's suspension relies on precisely aligned pivotal joints that let the wheels smoothly bounce up and down without affecting the direction they're pointing. This ensures stable steering even on uneven roads. Even a tiny misalignment in these crucial joints can throw off the vehicle's handling, potentially leading to dangerous situations on the road. That's why precise adjustment and regular maintenance of these joints are essential for safe driving.

They differentiate the following types of power steering system:

*Integral Power Steering*

It is designed to provide power assistance when the steering wheel requires between two and five pounds of effort. It comprises a steering gear with a worm-and-ball bearing nut and a hydraulic rack piston along the worm shaft. Hydraulic pressure assists in moving the nut in any direction. A reaction contact valve connected to the worm shaft thrust bearing controls the oil flow between the valve body and the gear and pinion assembly.

When the vehicle moves straight ahead, oil flows from the pump through open centre valves and back to the reservoir. Oil also circulates the rack piston to cushion road shocks. When the vehicle turns right, the worm's movement causes the control valve to restrict fluid flow to the right turn cylinder, increasing pump pressure on the right side of the rack piston and causing the ball nut to move right. The fluid flow shifts to the left-turn power cylinder for left turns, moving the rack piston and ball nut leftward.

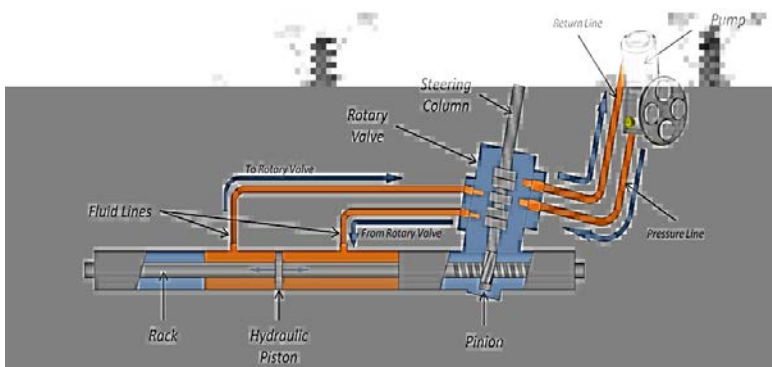
#### *Linkage Power Steering*

It separates the power cylinder from the steering gear and connects it to the steering linkage. The power assistance directly affects the steering linkage. In the neutral position (straight-ahead motion), a centring spring holds the spool valve in the control valve assembly at the centre, allowing oil to flow to both sides of the power cylinder.

When the vehicle turns left with significant wheel force, Pitman arm moves the spool control valve, removing centring spring pressure. It shifts the valve to the right side of the body, directing oil pressure to the right side of the power cylinder and turning the wheels left. When making a right turn, the process reverses, forcing the relay rod to turn the wheels right.



#### *Hydraulic Power Steering*



Used from the 1950s to 2000s, it relies on hydraulic assistance driven by a continuous pump. This system has drawbacks, including energy wastage when the vehicle requires no

assistance. The hydraulic pump, powered by the engine, pressurizes hydraulic fluid. This fluid increases the input force on the steering wheel, reducing the effort needed to turn the front wheels.

When the driver turns the wheel, the hydraulic pump pressurizes the fluid, which acts on a piston, transferring the driver's input force to the front wheels through a rack and pinion mechanism.

#### *Electric Power Steering (EPS)*

EPS is a modern power steering system that replaces hydraulic components with electric motors and sensors. Instead of hydraulic force, an electric motor

powered by the vehicle's battery assists the steering gear. Sensors detect the steering column's position and control the motor's torque.

When the driver turns the wheel, electronic sensors transmit the input to the vehicle's electric control unit. The unit analyses these inputs and sends voltage signals to the electric motor, which engages with the pinion gear and provides the necessary torque to the rack. This rotation of the rack steers the front wheels.

*Electro-hydraulic Power Steering*

Electro-hydraulic power steering is a hybrid system that combines hydraulic and electric power steering elements.

Unlike traditional hydraulic systems, it uses an electric motor to drive the hydraulic pump, reducing energy waste. However, it does not offer all the features of full-electric power steering.

In this system, the hydraulic motor is powered by an electric motor instead of being run by the engine. It is employed in some heavy pickup trucks and a few other vehicles.

**Exercise 3.**

*Match the beginning of the sentence given in the left column with its ending from the right column.*

A	B
1. When the steering wheel is turned...	A) by gears and levers to the front wheels
2. Most manufacturers use...	B) by the tie-rods
3. The steering wheel is linked...	C) they can be swung to the left or right
4. The front wheels are on pivots so...	D) rack and pinion type
5. Steering knuckle arms and wheels are turned...	E) gearing in the steering system causes the pitman arm to turn
6. Steering gear may be...	F) rack and pinion type, recirculating ball type, worm and sector type

**Exercise 4.**

*Answer the following questions.*

1. Efficiency Comparison:

Which power steering system, electric (EPS) or hydraulic (HPS), is smaller, lighter, and more energy-efficient? Why?

2. EPS Deep Dive:

Explain the basic functioning principles of the Electric Power Steering (EPS) system.

3. Motor Placement Variations:

How does the position of the electric motor differ in different forms of EPS systems? Briefly describe each variation.

4. Operating Principles Breakdown:

Discuss the specific operating principles of each EPS type: column assist, direct drive, and rack assist.

5. HPS vs. EPS:

In what key ways does the EPS system differ from the traditional Hydraulic Power Steering (HPS) system?

6. EPS Advantages:

Beyond efficiency, discuss other advantages of using EPS over HPS systems.

7. Electronic Failure Concerns:

Would a driver lose complete control of the vehicle if the EPS system experiences an electronic failure? Explain your answer.

8. Steer-by-Wire: A Future Vision:

What is the concept of steer-by-wire technology, and what are its potential advantages and disadvantages in the future of automobiles?

**Exercise 5.**

***Translate the following sentences into Ukrainian.***

1. Controlling a car's direction is essential, and achieving this relies on a mechanism capable of turning the front wheels.

2. Connected to the driver's steering wheel through a network of gears and levers, the front wheels respond to the driver's desired direction.

3. Without the steering system, a car would be limited to straight-line motion, unable to navigate turns or respond to driver input.

4. The reliability of the "rack and pinion" steering system makes it a popular choice for manufacturers, often eliminating the need for other designs.

5. In collision scenarios where the front of the car sustains damage, energy-absorbing columns play a crucial role in preventing the steering wheel from forcefully impacting the driver.

**Exercise 6.**

***Match the terms given in the left column with their Ukrainian equivalents from the right column.***

<b>A</b>	<b>B</b>
1) drive belt	А) регулятор
2) friction	В) підсилювач
3) power assist unit	С) рульова колонка

4) steering gear	D) робоча рідина
5) fail-safe mechanism	E) сервопривід
6) steer-by-wire	F) зменшити обертове зусилля
7) fluid	G) шестерня рульового механізму
8) to reduce the torque	H) ремінь приводу
9) steering column	I) тертя
10) controller	J) запобіжний механізм

***Exercise 7.***

***Read the following statements and decide whether they are true or false. Comment on the false ones.***

**1. Traditional Power Steering vs. Modern EPS:**

EPS isn't considered «traditional» anymore, contrasting it with systems like hydraulic power steering. EPS offers increased efficiency and environmental benefits.

**2. Efficiency at the Core:**

The key advantage of EPS is minimal power consumption when no steering assistance is needed. This sets the stage for exploring different motor positions.

**3. Exploring Motor Placement Variations:**

The placement of the electric motor varies in different EPS systems. Briefly describe each variation (P-EPS, D-EPS, R-EPS) within the answer.

**4. Deep Dive into D-EPS:**

The unique advantages of D-EPS are low inertia and friction. Explain the reason behind this benefit.

**5. Application Considerations:**

Some types of EPS are suitable for mid-to-full-sized vehicles. Answer with R-EPS, explaining its compatibility.

**6. The Future of Steering, Steer-by-Wire (SBW):**

SBW means a future technology eliminating mechanical components. Could SBW replace current systems once electronic controls become more reliable?

**7. Safety First, EPS Failsafe Mechanisms:**

EPS systems ensure safety in case of electronic failures. Explain the fail-safe feature that disconnects power.

***Remember...***

**SBW** SAFE BY WIRE  
**SBW** SEAT BELT WARNING  
**SBW** SHIFT BY WIRE  
**SBW** STEER BY WIRE



***Exercise 8.***

***Read the information about Passive Rear Wheel Steering and fill in the blanks with the proper words given below.***

Many modern cars have a hidden helper: passive rear-wheel steering. During a turn, the rear wheels subtly shift inwards, 1) ..... a natural tendency for them to want to go outwards. This might sound counterintuitive, but it actually 2) ..... stability, making your car feel more planted and predictable.

The secret lies in suspension: specifically, the geometry and rubber bushings. As you turn, the forces acting on the car 3) ..... those rear wheels slightly inwards, correcting for the outward pull. This effect is called compliance understeer, and it's present 4) ..... almost all cars, even if you never realized it.

Different suspension types achieve this in different ways: Watt's links on live 5) ....., toe control bushings on twist beams, and specific bushing rates on independent suspensions. Some setups, like Hotchkiss axles and certain trailing arm suspensions, naturally have the opposite effect (compliance oversteer), but adjustments can be made to counter it.

While not a recent invention, passive rear-wheel steering is often unappreciated. But next time you take a smooth 6) ....., remember, your car's back wheels are silently playing their part in the dance of handling.

1. a) cornering	b) countering	c) swerving	d) accelerating
2. a) rotates	b) brakes	c) boosts	d) curves
3. a) decrease	b) corrupt	c) approve	d) push
4. a) on	b) behind	c) over	d) under
5. a) arms	b) axles	c) racks	d) backs
6. a) counter	b) advice	c) corner	d) axle

## ***Exercise 9.***

***Read the following text and translate it into Ukrainian.***

### **The Components of the Car's Electrical System**

The modern automobile is a marvel of engineering, with various intricate systems working seamlessly to provide a smooth and efficient driving experience. One of the critical systems that powers numerous functions in a car is the electrical system. Understanding its basic components empowers you to appreciate the complexity and importance of your car's electrical system. It's not just about turning on the lights; it's the intricate network that keeps your car moving safely and efficiently. Let's discuss the key elements of the car's electrical system.

#### ***Battery: The Power Source***

At the heart of the car's electrical system is the battery. Typically located under the hood, the battery is responsible for storing and supplying electrical energy to start the engine and power various electrical components when the vehicle is not running. It serves as a reservoir of power that ensures the smooth functioning of the car's electrical system.



#### ***Alternator: Power Generation***

While the battery is the initial power source, the alternator plays a crucial role in keeping the electrical system running. The alternator generates electrical power by converting mechanical energy from the engine into electrical energy. It charges the battery and provides electricity to power lights, the radio, and other electrical components while the vehicle is in operation.



#### ***Starter Motor: Igniting the Engine***

When you turn the key in the ignition, the starter motor comes into action. Its primary function is to engage with the engine's flywheel, setting the engine in motion. Once the engine is running, the alternator takes over to supply electrical power to the vehicle.

#### ***Ignition System: Sparks of Power***

The ignition system is responsible for producing the spark that ignites the fuel-air mixture in the engine's cylinders. This system typically includes the ignition coil, spark plugs, and the ignition control module. The precise timing and intensity of the spark are critical for the efficient combustion of fuel, ensuring optimal engine performance.

#### ***Wiring and Connectors: The Circulatory System***

Wiring serves as the circulatory system of the car's electrical network, connecting various components to ensure the seamless flow of electricity. High-

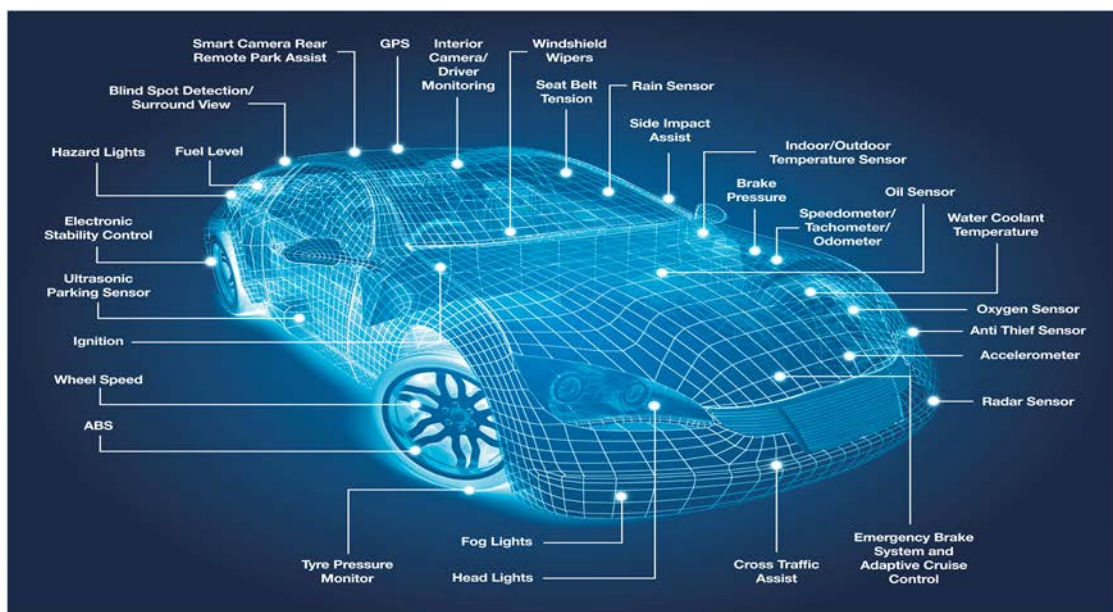
quality wiring and connectors are essential for reliable electrical connections, preventing power loss and electrical malfunctions.

### *Lights and Accessories: User Interface*

The electrical system powers the lights and accessories that contribute to the comfort and safety of the vehicle. This includes headlights, taillights, interior lights, power windows, air conditioning, and entertainment systems. These components enhance the overall driving experience and ensure visibility and safety on the road.

### *Sensors: Monitoring and Control*

Modern vehicles are equipped with an array of sensors that play a vital role in monitoring and controlling various functions. Sensors, such as those for the engine control unit (ECU) and anti-lock braking system (ABS), provide real-time data to optimize performance, fuel efficiency, and safety.



Understanding the components of the car's electrical system is integral to maintaining and troubleshooting electrical issues. Regular inspections and timely maintenance can help ensure the longevity and reliability of the electrical system, contributing to the overall performance of the vehicle. As automotive technology continues to advance, the importance of a well-functioning electrical system becomes even more pronounced in the modern driving experience.

### ***Exercise 10.***

***Answer the following questions.***

1. What components form the core of the car's electrical system?
2. How do these components work together?
3. How does the battery generate electricity?
4. What is an alternator? What is the primary purpose of the alternator?
6. What role does the starter play in getting the engine going?

7. What are some common reasons why the car's electrical system might malfunction?

**Exercise 11.**

**Read the following text and fill in the blanks with the proper words given below.**

The early days of automobiles relied on cumbersome magneto systems. But with the widespread adoption of electric 1) ..... and larger batteries offering a steady power source, a new era of ignition ignited (pun intended). These advancements paved the way for systems with the following purposes:

*Interrupted current:* Instead of generating their own electricity, they relied on the battery's constant 2) .....

*Boosted voltage:* Used a transformer to significantly increase the voltage for 3) ..... creation.

*Distributed sparks:* Utilized a distributor to direct the high-voltage pulse to the right spark 4) ..... at the precise moment.

The pinnacle of this evolution arrived in 1910: Charles Kettering's revolutionary battery-powered ignition. This marvel of engineering incorporated:

*A single coil:* Functioning as a transformer to 5) ..... the low battery voltage (6 or 12V) to the high voltage needed for ignition.

*Points:* Acting as a switch, allowing the coil to charge magnetically and then releasing the 6) ..... energy when opened by a cam, inducing a high voltage.

*A capacitor:* Storing and smoothing out the current flow.

*A distributor:* Directing the generated spark to the correct 7) ..... based on engine timing.

1. a) starters	b) sparks	c) brakes	d) packs
2. a) pulse	b) voltage	c) coil	d) starter
3. a) ignition	b) lubrication	c) spark	d) brake
4. a) distributor	b) charger	c) redactor	d) plug
5. a) raise	b) allow	c) trap	d) produce
6. a) mapped	b) stored	c) driven	d) fixed
7. a) pulse	b) power	c) cylinder	d) brake

**Exercise 12.**

**Fill in the blanks with the proper verbs. Pay attention to the use of Conditional I.**

1. *Unless Alison ..... her marks, she ..... to the birthday party.*

- a) improves ... won't go;
- b) improves ... will go;
- c) doesn't improve ... will go.

2. *If Bernard has to draw this, he ..... it for sure.*

- a) draw;
- b) will draw;
- c) would draw.

3. *Cecil ..... very upset if her flight ..... to be delayed.*

- a) will be ... turn out;
- b) am ... will turn out;
- c) am ... turn out.

4. *If Diana doesn't take any medicine, she ..... better.*

- a) cannot feel;
- b) shouldn't feel;
- c) don't have to feel.

5. *Edward won't go to the restaurant unless they ..... him.*

- a) invite;
- b) don't invite;
- c) will invite.

6. *If the article is interesting, it ..... shared among students.*

- a) will be;
- b) is;
- c) would be.

7. *If the problem with engine really exists, Frank ..... fired.*

- a) is;
- b) isn't;
- c) will be.

8. *Gracy ..... thankful if your friend ..... a word to anybody.*

- a) will be ... will not say;
- b) is ... say;
- c) will be ... say.

9. .... her that Henry loves her, if you want them to be together.

- a) Tell;
- b) Will tell;
- c) Don't tell.

10. Joanna and her boyfriend ..... cooperate, if they really want to work in the same company.

- a) will should;
- b) have to;
- c) should.

11. Kristian ..... you while repairing the car, unless you ..... him.

- a) won't assist ... call;
- b) won't assist ... don't call;
- c) will assist ... call.

12. If Luissa is in love with her boyfriend, she ..... him to Argentina.

- a) follow;
- b) follows;
- c) will follow.

### **Exercise 13.**

**Open the brackets and complete the sentences with Conditional I.**

1. It can be difficult to get there on time if you \_\_\_\_\_ an automobile.  
(have)

2. Soap dissolves if you \_\_\_\_\_ it in water. (leave)

3. If he rings the bell, the receptionist \_\_\_\_\_. (come)

4. Tom's parents will be worried if he \_\_\_\_\_ home very late. (arrive)

5. If the teacher allows me to come in, I \_\_\_\_\_ my best. (show)

6. I \_\_\_\_\_ to invite Bob if I invite Linda. (have)

7. If Nadin meets her brother with Olivia, she \_\_\_\_\_ her about his girlfriend. (tell)

8. If Porter earns much money he \_\_\_\_\_ a new automobile. (buy)

9. Stamps can be good fun if you \_\_\_\_\_ collecting things. (enjoy)

10. If Raymond doesn't call the engineer, he \_\_\_\_\_ able to repair his car.  
(be)

11. My parents \_\_\_\_\_ angry if I don't do everything right now. (get)

12. If you want to understand the text, you \_\_\_\_\_ to study the new words. (have)

## UNIT 4

**Topic: Braking System.**

**Vocabulary Practice: Common Types and Components of Car Braking System.**

**Applied Grammar: Conditional II. Conditional III.**

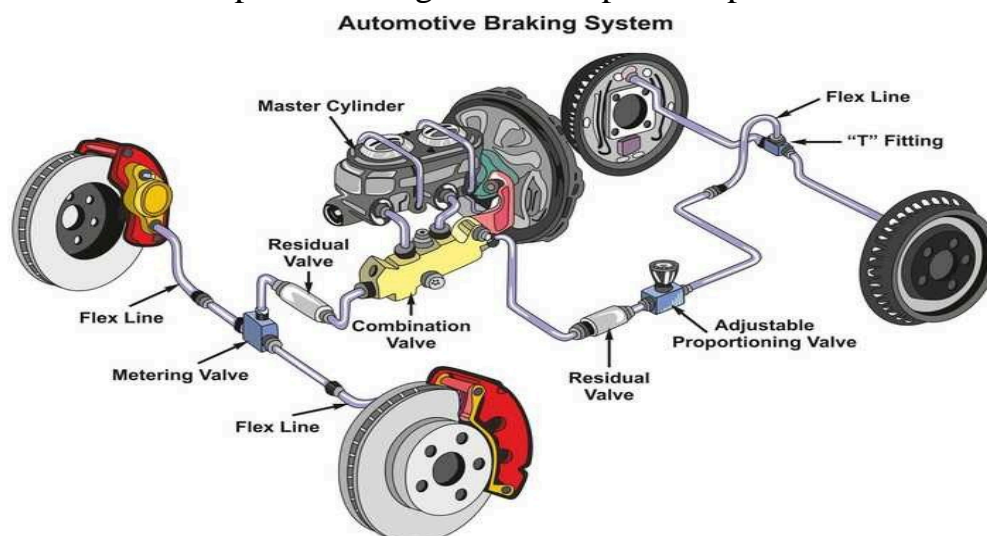
*Exercise 1.*

*Read and translate the following text into Ukrainian.*

### A Car's Braking System

A brake is a mechanical device designed to restrain motion by absorbing energy from a moving system usually by means of friction. It is used to slow or stop a moving vehicle, wheels, axle, etc.

The car braking system includes various components working together to effectively slow down and stop the vehicle when required. It accomplishes this by converting the car's kinetic energy into heat energy, which is then dissipated to reduce the car's speed or bring it to a complete stop.



This system ensures safe driving by providing control over the vehicle's motion and preventing accidents. Understanding the intricacies of the car braking system empowers car owners to recognize potential issues, perform regular maintenance, and ensure the brakes function optimally, contributing to overall road safety.

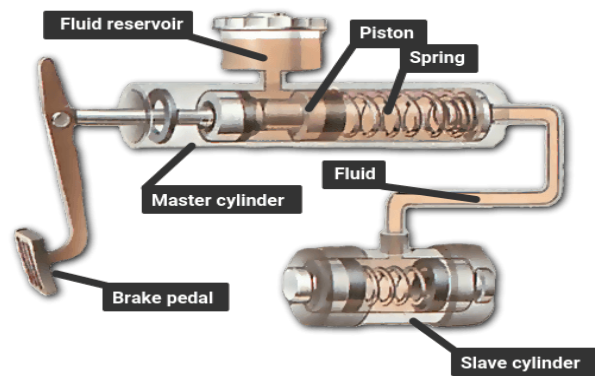
They differentiate the following components of the braking system of an automobile:

*Brake Pedal*

When you press the brake pedal with your foot, it initiates the braking process. The brake pedal is connected to the master cylinder, which is the heart of the braking system.

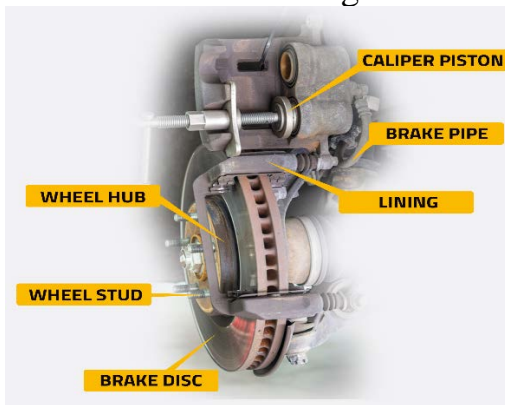
### *Master Cylinder*

The master cylinder is a hydraulic device responsible for converting the mechanical force applied to the brake pedal into hydraulic pressure. When you press the brake pedal, it pushes a piston inside the master cylinder, building up hydraulic pressure in the brake lines.



### *Brake Lines*

The hydraulic pressure generated by the master cylinder is transmitted through brake lines to the individual brake calipers or wheel cylinders at each wheel. These brake lines are durable and made to withstand high pressures to ensure efficient braking.



### *Brake Calipers/Wheel Cylinders*

Depending on the type of brake system (disc or drum), your car will have either brake calipers or wheel cylinders. These components act as actuators, converting hydraulic pressure back into mechanical force. Brake calipers apply force to the brake pads, while wheel cylinders push the brake shoes against the drums.

### *Brake Pads/Shoes*

The final stage of the braking process involves the brake pads or shoes making contact with the brake rotors or drums. These components are lined with a special friction material that creates the necessary friction to slow down or stop the car. When the brake pads or shoes clamp down on the spinning rotors or drums, it creates resistance, converting the kinetic energy of the moving vehicle into heat energy, and thus, decelerating the car.

### *Exercise 2.*

*Translate the following sentences into Ukrainian.*

1. Emphasis on Front Brakes: Unlike their rear counterparts, the front brakes shoulder the heavier burden of stopping the car.
2. Master Cylinder as Commander: The master cylinder sends out its orders in the form of hydraulic pressure, relayed to the slave cylinders.
3. Fluid Power: Imagine the fluid as a messenger rushing to the slave cylinders at each wheel, pushing pistons outward to squeeze the brakes.
4. Air Pressure on Demand: High outside air pressure exerts a powerful force, pushing the diaphragm forward.

5. Intentional Balance: Unlike the front brakes, the rear ones are designed with less muscle to prevent skidding and maintain vehicle stability.

6. A Dance of Braking: These innovative systems employ a rapid tap-dance of applying and releasing pressure to prevent wheel lockup.

**Exercise 3.**

**Match the words given in the left column with their Ukrainian equivalents from the right column.**

<b>A</b>	<b>B</b>
1) air valve	A) сервомеханізм
2) hydraulic circuit	B) впускний колектор
3) inlet manifold	C) важіль, шток
4) master cylinder	D) часткове розрідження
5) partial vacuum	E) головний циліндр
6) pipe	F) робочий циліндр
7) rod	G) занос
8) servounit	H) трубка
9) skid	I) ніпель
10) slave cylinder	J) гідравлічна система

**Exercise 4.**

**Translate the following sentences into English.**

1. Гальма – це найважливіший механізмом автомобіля, засіб забезпечення його активної безпеки.

2. Гальма використовуються для уповільнення руху або зупинки автомобіля.

3. Розрізняють два типи гальм, а саме: барабанні гальма та дискові гальма.

4. Гідравлічний або пневматичний привід використовується на більшості автомобілів.

5. Гальмування автомобіля починається з моменту, коли водій натискає на гальмівну педаль.

***Exercise 5.***

***Read the following statements and decide whether they are true or false. Comment on the false ones.***

1. Four-wheel drive (4WD) empowers your vehicle with a drivetrain that delivers engine torque to all four wheels simultaneously, turning even challenging terrain into your playground.

2. Differentials of any four-wheel-drive system are power distributors, channeling torque from the driveshaft to each wheel.

3. The types of differentials significantly impact how well your vehicle utilizes available traction.

4. Transfer Case: In two-wheel-drive cars, this device manages power distribution between front and rear axles.

5. In 4WD vehicles, it takes center stage, engaging (or disengaging) the front axle for all-wheel grip.

6. Part-time 4WD systems rely on the transfer case to «lock» the front and rear axle drive shafts together, forcing all wheels to rotate at the same speed. This offers enhanced traction but is best suited for low-speed, off-road conditions.

7. Gearing Down for Tough Terrain: Some transfer cases boast an extra set of gears, granting the vehicle low-range capabilities for conquering challenging terrain at slower speeds.

8. Wheels on Duty: Each wheel in your car connects to a dedicated driveshaft that transmits power from the engine.

9. Hub Disconnecting Bliss: When 4WD isn't needed, locking hubs cleverly disconnect the front wheels from the intricate network of differential gears, half-shafts, and the driveshaft.

10. Manual Hubs: A Past Adventure: Early 4WD systems required drivers to engage them manually. Imagine getting out, turning a knob on each front wheel, and then hopping back in for off-road action.

11. On-the-Go Engagement: Unlike their predecessors, modern all-wheel-drive systems allow seamless engagement even while the vehicle is in motion, offering greater convenience and flexibility.

12. Smart Braking to the Rescue: In some cars, the ingenious ABS system steps in as a guardian angel, applying brakes selectively to wheels that lose traction, preventing skids and maintaining control.

***Exercise 6.***

***Read the following text and fill in the proper words from the given below.***

Imagine facing an emergency on the road, heart pounding, 1) ..... adrenaline surging. Braking hard might seem natural, but many drivers struggle to 2) ..... maximum force in those crucial moments. This is where Brake Assist (EBA) shines, acting as your guardian angel on four wheels.

Unlike humans, EBA can instantly detect a «panic stop» by analyzing how quickly you 3) ..... the brake pedal. Think of it as reading your mind and foot at the same time!

If the system senses an 4) .....emergency, it steps in, automatically applying full braking force faster than any human foot could. This can significantly shorten your stopping 5) ....., potentially avoiding an accident altogether.

Imagine stopping up to 70 feet (21 meters) sooner at highway speeds! That’s the potential lifesaving power of EBA, especially in those dreaded «rear-end collisions».

EBA is a master of measuring speed. It primarily focuses on how quickly you 6) ..... the brake pedal, but some systems even monitor how fast you release the accelerator, 7) ..... panic braking situations.

When EBA detects panic, it automatically boosts your braking power, 8) .....compensating for your natural tendency to not brake hard enough. Studies show this can 9) ..... stopping distances by up to 20%, giving you precious seconds and meters in critical situations.

Remember, EBA is just one technology helping keep you safe. But knowing it’s there, ready to respond faster than you ever could in a panic, can give you some valuable peace of mind on the 10) .....

1. a) problem	b) adrenaline	c) confrontations	d) fault
2. a) apply	b) increase	c) protect	d) develop
3. a) identify	b) recognize	c) slam	d) find
4. a) moment	b) value	c) confrontations	d) emergency
5. a) distance	b) disturbance	c) sense	d) accident
6. a) find out	b) press	c) increase	d) sense
7. a) reducing	b) increasing	c) anticipating	d) measuring
8. a) reducing	b) anticipating	c) increasing	d) compensating
9. a) reduce	b) increase	c) accelerate	d) manipulate
10. a) moment	b) road	c) turbine	d) car

***Exercise 7.***

***Read and translate the following text into Ukrainian.***

**Types of Braking System**

*Electromagnetic Brake System*

This is one of the rising design of the brake system, it uses an electric motor that is contained in the automobile. The motor aids the stopping of the vehicle. Electromagnetic braking system types are used in most hybrid vehicles where electric motor charge the batteries and powers the brakes. In some buses, a secondary retarder brake that uses an internal short circuit and generator is employed.

*Frictional Brake System*

The frictional types of braking systems are common in automobiles. Their design is complex but serviceable and is typically available in two forms; pads and shoes. Just as it's named, friction is used in the braking system to stop the vehicle from or device from moving. In its components, a rotating device with a stationary pad and a rotating weather surface. Band brakes contained shoes that constrict and rub against the outside of the rotating drum. Alternatively, a drum brake with shoes rotates and will expand to rub against the inside of the drum.

*Hydraulic Brake System*

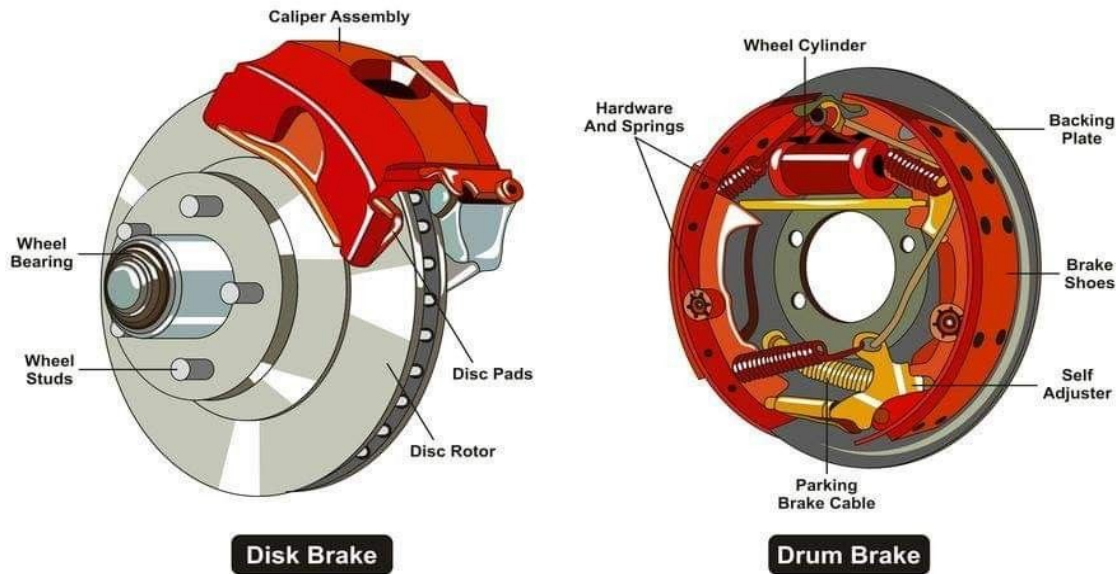
The hydraulic braking system types are composed of master cylinders that receive hydraulic braking fluid from a reservoir. Through connections of an assortment of metal pipes and rubber fittings, the system is attached to the cylinders of the wheel. The wheel features two opposite pistons, located on the band or drum brakes. The pressure pushes the piston apart, forcing the brake pads into the cylinders, which causes the wheel to stop moving.

*Air brake system*

The air braking system types are commonly found in heavy vehicles such as trucks, buses, etc. just like other types, the brake pedal is pressed. However, air from the atmosphere enters the compressor through an air filter to the reservoir through an unloader valve. It further enters the brake chamber through a brake valve which is fitted to control the intensity of braking. This results in braking.

*Drum and Disc Brake Diagram*

## Automotive Braking



### *Parking and Emergency Brake System*

Parking and emergency types of braking systems work with levers and cables where it's controlled mechanically by force. Though it's controlled using a button on newer vehicles to stop the vehicle in case of emergency or while parking on a hill. The system can bypass the normal braking system when it malfunctions.

When the brake is engaged, a cable pulls and it passes to the intermediate lever that causes the force to increase and pass to the equalizer. The equalizer splits into two cables, it divides the force and sends them to the rear wheels aiding the slow and stopping of the vehicle.

The braking system bypasses other braking systems by controlling brake shoes directly. The system is beneficial if the typical braking system fails.

### *Servo Brake System*

The servo braking system types are found on most vehicles today, they are designed to increase the amount of pressure the driver applies through the brake pedal. The system uses a vacuum in the inlet manifold to generate the extra pressure required for the brake to happen. Also, the systems are only effective when the engine is running. In some vehicle designs, more than the braking system is included as they work in unison to offer a stronger and more reliable system. However, the system fails occasionally based on the combination of the types of brakes, which may result in motor accidents.

### *Pumping Brake System*

The types of braking systems are employed on automobiles whenever a pump is included in the design. It's used in an internal combustion piston motor to stop the fuel supply, which in turn causes the internal pumping to loss to the engine, causing braking to occur.

**Exercise 8.**

**Answer the following questions.**

1. What are the main types of brakes used on motor vehicles? Compare and contrast efficiency between disc and drum brakes.
2. How do hydraulic systems amplify braking power dive into the secrets of the hydraulic circuit, the heart of your car's braking system?
3. Which type of brakes is more efficient? Why?
4. Pumping up the brakes: what creates the stopping power?
5. Why isn't all-wheel braking equal? Discover the safety reasons behind different brake strengths.
6. What creates pressure in the hydraulic brake system?
7. Why are the rear brakes made less powerful than the front brakes?
8. What is a power assisted braking system?
9. How does the Servo Unit multiply your braking effort, making stopping easier and safer?
10. What function does the servo unit carry out?

**Exercise 9.**

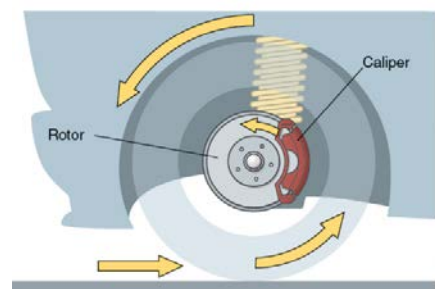
**Read the following statements and choose the proper answer.**

1. Which of the following is not true regarding a modern vehicle brake system?

- a. Uses different size pistons to increase or decrease hydraulic pressure.
- b. Consists of brake assemblies and hydraulic system that applies them.
- c. Friction between surfaces convert kinetic energy into heat energy.
- d. Primarily designed as a holding brake system.

2. What force is being illustrated in the image?

- a. Rotational force twisting the brake support.
- b. Stopping force between the brake pads and rotors.
- c. The counter force of the ground on the wheel and tire assembly.
- d. Twisting force of the rotor on acceleration.



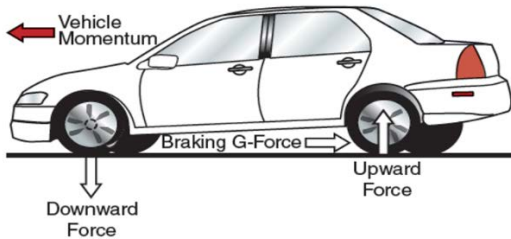
3. Which statement is true about antilock brake systems (ABS)?

- a. It allows the vehicle to stop much faster on wet roads.
- b. Prevents the brakes from becoming stuck applied.
- c. It helps prevent skidding and maintain directional control.
- d. It reduces the stopping distance required in an emergency.

4. Which is not a factor that affects braking?

- a. The road elevation.
- b. The weight of the vehicle.
- c. The condition of the tires.
- d. The road surface and condition.

5. Why does a vehicle “nose dive” on hard braking?



- a. The disc brakes are on the front, and drum brakes are always in the rear.
- b. The hydraulic system is designed to cause the nose dive.
- c. The engine and transaxle in the front are heavier than an empty trunk.

d. The rotational force when braking causes weight transfer.

6. How much kinetic energy is added if a 2,000 lb vehicle traveling 20 mph doubles its weight?

- a. The kinetic energy goes from 26,743 to 28,743 ft/lbs.
- b. The kinetic energy doubles.
- c. The kinetic energy increases to 855,600 ft/lbs.
- d. The kinetic energy quadruples.

7. What happens if a 4,000 lb vehicle traveling at 20 mph doubles its speed?

- a. The kinetic energy doubles.
- b. The kinetic energy goes from 26,743 to 855,600 ft/lb.
- c. The kinetic energy goes from 53,486 to 855,600 ft/lb.
- d. The kinetic energy quadruples.

8. Which best describes the transfer of energy in the image?

- a. Potential energy to heat energy to kinetic energy.
- b. Potential energy to chemical energy to heat energy.
- c. Heat energy to potential energy to rolling energy.
- d. Potential energy to kinetic energy to heat energy.



9. In both disc and drum brakes, ultimately where does the heat from friction end up?

- a. In the brake rotor and brake drum.
- b. In tire and the atmosphere.
- c. In the brake pad and brake shoe.
- d. In the wheel and lug nuts.

10. Which is not a type of brake fade?

- a. Water fade.
- b. Heat fade.
- c. Pedal fade.
- d. Hydraulic fade.

**Exercise 10.**

**Read the information about the difference between 4WD and AWD and fill in the blanks with the proper words given below.**

Four-wheel drive (4WD), all-wheel drive (AWD) or 4×4 (“four by four”) is a four-wheeled vehicle with a 1) ..... that allows all four wheels to receive torque from the engine simultaneously. This means that all four wheels can contribute to propelling the vehicle forward, giving it better traction and handling in difficult conditions such as snow, ice, mud and sand.



There are two main types of four-wheel drive systems: part-time and full-time. Part-time 4WD systems are typically only used when needed, such as when driving on off-road terrain. Full-time 4WD systems are engaged all the time, and they can automatically 2) ..... the amount of power that is sent to each wheel.

Four-wheel drive vehicles are often more expensive than two-wheel drive vehicles, but they can offer significant 3) ..... in terms of traction and handling. If you frequently drive in difficult conditions, then a four-wheel drive vehicle may be a good option for you.

The once-vast gap between AWD and 4WD vehicles is steadily shrinking thanks to technological innovation:

*Improved 4WD comfort:* Bumpy rides once synonymous with 4WD are fading away. Advancements in chassis 4) ..... and suspension technology have significantly smoothed the experience.

*Evolving AWD capability:* AWD vehicles are becoming increasingly adept at handling off-road challenges. Advanced 5) ..... and traction control systems enable them to conquer a wider range of surfaces.

However, distinct strengths remain for each system:

*Rugged terrains demand 4WD:* For extremely uneven ground or serious off-roading, 4WD reigns supreme. This is further bolstered by its higher ground 6) ..... and driver-controlled operation.

*Everyday versatility favors AWD:* For a daily driver with occasional off-road excursions, AWD wins. It offers superior ride quality and 7) ..... compared to 4WD, making it a more comfortable and convenient choice for everyday use.

1. a) drivetrain	b) crankcase	c) trucks	d) camshaft
2. a) activated	b) adjust	c) drive	d) move
3. a) traction	b) moments	c) energy	d) advantages
4. a) drive	b) crank	c) design	d) shaft
5. a) sensors	b) bricks	c) benches	d) sides
6. a) cases	b) clearance	c) ground	d) transferring
7. a) importance	b) passage	c) handling	d) transfer

**Exercise 11.**

**Open the brackets and complete the sentences with Conditional II.**

1. He'd give your friend her number if I ..... it. (have)
2. If I won the lottery, I think I ..... my job. (give up)
3. If everybody in the world ..... 1 dollar, we'd finish the world's problems. (donate)
4. If you ..... my husband, I'd make you the happiest man on earth. (be)
5. I ..... about that if I were you. (worry)
6. If you told grandpa the truth, he ..... a heart attack. (have)
7. I wouldn't call unless I ..... a real emergency. (have)
8. You ..... to spend so much time cleaning your room if you didn't store so much stuff. (have)
9. If you ..... so much noise, I could concentrate. (make)
10. The flowers ..... if you watered them more. (grow)
11. You ..... so much money if you didn't eat out all the time. (save)
12. If you found £1000 on the ground, ..... You ..... the money? (keep)

**Exercise 12.**

**Open the brackets and complete the sentences with Conditional III.**

1. You (might/not/be) ..... ill if you hadn't drunk so cold Pepsi yesterday.
2. Nobody knows what (may/happen) ..... if Alice had accepted the job in New York last year.
3. The picnic (be) ..... much more pleasant if the weather had not been so terrible. We got soaked.
4. If Joseph (know) ..... it was my birthday yesterday, he would have brought me a bucket of flowers.
5. I'd have gone to the party if they (invite) ..... me.

6. (You/go) ..... to the party if they had invited you?
7. You (might/pass) ..... the exam if you'd studied harder.
8. I (not/say) ..... anything if I had known what her reaction was going to be.

**Exercise 13.**

**Open the brackets and complete the sentences with Conditional I, Conditional II or Conditional III.**

1. If Mr Johnson ..... (sell) his car last year, he would have sold it more expensive.
2. If Margaret takes her driving lessons every week, she ..... (pass) her driving test successfully.
3. If Mr Cooper ..... (read) the newspapers every day, he would know more about the latest news in education.
4. If Joseph ..... (not stop) drinking cold Cola so often, he'll soon get sick.
5. If Barbara had told him the truth, he ..... (help) her.
6. If our neighbour Mr Cameron heard a strange noise, she ..... (call) 911 at once.
7. If Leonel ..... (be) lucky enough, he would have won that game.
8. If my mother got the earlier bus, she ..... (can) return back home at 6 o'clock.
9. If his grandfather missed the train, he ..... (take) a taxi and arrive on time.
10. If Bob's mother ..... (cook) plum pie, he'll give his sister a piece.
11. If Nilse ..... (not leave) earlier, he would miss the bus.
12. If your granny ..... (be) you, she would get a driving license on the first try.
13. If Sophia ..... (win) a lottery, she will go to Maldives for three weeks.
14. If Michel is ill, he ..... (not come) to our birthday party.
15. The students ..... (play) football if it stopped raining.

## REFERENCES

1. Баб'як Ж. English : навч. посібник з англійської мови для студентів I-II курсів спеціальності «Автомобілі і автомобільне господарство» / Ж. В. Баб'як, О. І. Боднар, Л. А. Джиджора, Л. Й. Петришина. – Тернопіль : ТНТУ ім. І. Пулюя, 2013. – 112 с.
2. На Урок : вебсайт [Електронний ресурс]. – Режим доступу: <https://naurok.com.ua/urok-breaking-sysem-134061.html> (дата звернення: 7.02.2024).
3. Шестопал О. Англійська мова для студентів-автомобілістів : навчальний посібник / О. В. Шестопал, В. О. Сенченко, А. А. Слободянюк. – Вінниця : ВНТУ, 2018. – 75 с.
4. Baxter D. Career Paths Automotive Industry / D. Baxter, V. Evans. – Express Publishing, 2016. – 41 p.
5. Braking System in Automobile – Types of Brakes Explained [Електронний ресурс] / CARS 24. – Режим доступу: <https://www.cars24.com/blog/brake-system-in-cars/> (дата звернення: 7.02.2024).
6. Kahoot : вебсайт [Електронний ресурс]. – Режим доступу: <https://create.kahoot.it/details/cdx-mast-a5-chapter-2-principles-of-braking/3c20d32a-b315-4a9c-a78c-055f6db2a031> (дата звернення: 7.02.2024).
7. Murphy R. English Grammar in Use. Intermediate. / R. Murphy. Cambridge University Press, 2019. – 396 p.
8. Steering System Construction [Електронний ресурс] / CAR ANATOMY Diagram. – Режим доступу: <https://www.newkidscar.com/steering/steering-system-construction/> (дата звернення: 7.02.2024).
9. StudentLesson : вебсайт [Електронний ресурс]. – Режим доступу: <https://studentlesson.com/automotive-braking-system-definition-functions-working/> (дата звернення: 7.02.2024).
10. What Are the Components of the Car's Electrical System [Електронний ресурс] / Stronghold. – Режим доступу: <https://www.cnstronghold.com/news/cars-electrical-system-components.html> (дата звернення: 7.02.2024).
11. What Is Power Steering System: Types, Working & More [Електронний ресурс] / АСКО. – Режим доступу: <https://www.acko.com/car-guide/what-is-power-steering-system/> (дата звернення: 7.02.2024).

*Навчальне електронне видання*

Методичні вказівки  
до виконання самостійних робіт  
«English for Automotive Engineering Students. Part II»  
для студентів спеціальностей  
274 «Автомобільний транспорт»,  
275 «Транспортні технології»

Укладачі: *Тетяна Григорівна Рудницька*  
*Алла Анатоліївна Слободянюк*

Рукопис оформила: *А. Слободянюк*

Редактор: *О. Малетіна*

Оригінал-макет виготовила: *О. Дубовик*

Підписано до видання 26.03.2024

Гарнітура Times New Roman.

Зам. № P2024-074

Видавець та виготовлювач  
Вінницький національний технічний університет,  
Редакційно-видавничий відділ.  
ВНТУ, ГНК, к. 114.  
Хмельницьке шосе, 95,  
м. Вінниця, 21021.  
press.vntu.edu.ua;  
Email: irvc.vntu@gmail.com  
Свідоцтво суб'єкта видавничої справи  
серія ДК No 3516 від 01.07.2009 р.