2024 年度入学試験問題　214

情報科学部Ａ方式Ⅱ日程・デザイン工学部Ａ方式Ⅱ日程
理工学部Ａ方式Ⅱ日程・生命科学部Ａ方式Ⅱ日程

1　限　英　　語　（90 分）

〈注意事項〉

1. 試験開始の合図があるまで，問題冊子を開かないこと。
2. 解答はすべて解答用紙に記入しなさい。
3. マークシート解答方法については以下の注意事項を読みなさい。

マークシート解答方法についての注意

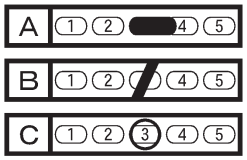
マークシート解答では，鉛筆でマークしたものを機械が直接読みとって採点する。したがって解答は HB の黒鉛筆でマークすること（万年筆，ボールペン，シャープペンシルなどを使用しないこと）。

記入上の注意

1. 記入例　　解答を 3 にマークする場合。

（1）正しいマークの例

（2）悪いマークの例



枠外にはみださないこと。

○でかこまないこと。

2. 解答を訂正する場合は，消しゴムでよく消してから，あらためてマークすること。
3. 解答用紙をよごしたり，折りまげたりしないこと。
4. 問題に指定された数よりも多くマークしないこと。

4. 問題冊子のページを切り離さないこと。

〔Ⅰ〕

問1　(1)～(4)において，最も強いアクセントのある位置が他の二つと異なる語をそれぞれイ～ハから一つ選び，その記号を解答用紙にマークせよ。

(1)	イ	con-nect	ロ	col-league	ハ	eas-y
(2)	イ	de-ter-mine	ロ	Jap-a-nese	ハ	pol-lu-tion
(3)	イ	es-ti-mate	ロ	ex-e-cute	ハ	o-ver-whelm
(4)	イ	Eu-ro-pe-an	ロ	su-per-vi-sor	ハ	veg-e-ta-ble

問2　(1)～(4)において，下線部の発音が他の三つと異なる語をそれぞれイ～ニから一つ選び，その記号を解答用紙にマークせよ。

(1)	イ	allow	ロ	amount	
	ハ	aunt	ニ	sound	
(2)	イ	ahead	ロ	breathe	
	ハ	dead	ニ	meant	
(3)	イ	ache	ロ	chaos	
	ハ	chemical	ニ	chamber	
(4)	イ	though	ロ	sew	
	ハ	slow	ニ	suit	

問３　(1)～(7)において，空欄に入る最も適切なものをそれぞれイ～ニから一つ選び，その記号を解答用紙にマークせよ。

(1) I couldn't believe [　　] she said. I had the impression that she was rather thoughtful, but I was wrong.

イ why　　ロ that　　ハ what　　ニ how

(2) Wow, the homework today is [　　] I expected. I'm getting excited!

イ no more boring as　　ロ not more boring as

ハ not much boring as　　ニ not so boring as

(3) When I go snowboarding, I find my knowledge of physics [　　] useful.

イ be　　ロ to be

ハ having been　　ニ to have been

(4) Do you see the coffee shop [　　] the street? I ran into Omar there yesterday.

イ over　　ロ beyond　　ハ against　　ニ across

(5) A: I really need to improve my grades.

B: It's all [　　] time management skills.

イ about　　ロ since　　ハ near　　ニ over

(6) A: You didn't do your math homework. What happened?

B: [ ] I spent last night preparing for today's English test.

イ No pain, no gain.

ロ Things are looking up.

ハ Time is money.

ニ I couldn't help it.

(7) Student A: I am thinking of joining the university's computer club.

Student B: Me too! Do you know any of the members?

Student A: Some people who graduated from my high school are already members.

Student B: [ ]

イ Do you think you could introduce me to them?

ロ I don't know why anyone would join that club.

ハ It is too bad we don't know anyone in the club.

ニ Oh, is this club for high school students?

問４　(1)～(3)において，それぞれ下の語(句)イ～ホを並べ替えて空所を補い，最も適切な文を完成させよ。解答は２番目と４番目に入る語(句)を選び，その記号を解答用紙にそれぞれマークせよ。なお，文頭の大文字・小文字は問わない。

(1)　It may take her [　　] [2] [　　] [4] [　　] other students, but I'm sure she will be fine.

イ　a while　　ロ　catch　　ハ　to
ニ　up　　ホ　with

(2)　[　　] [2] [　　] [4] [　　], I want to pass the entrance exam.

イ　difficult　　ロ　how　　ハ　is
ニ　it　　ホ　no matter

(3)　Oh, it's cold here.　Someone [　　] [2] [　　] [4] [　　].

イ　have　　ロ　left　　ハ　must
ニ　open　　ホ　the window

〔Ⅱ〕 つぎの設問に答えよ。

問１　2019年，2021年，および2022年の世界の空港の利用状況に関するつぎの表を見て，また英文を読んで，以下の設問に答えよ。

Table 1

The Change in the Number of Passengers (Both International and Domestic)

Rank			Airport	2022	Change in Percent (%)[*1]	
2022	2021	2019			From 2021 to 2022	From 2019 to 2022
1	1	1	Atlanta, US	93,699,630	23.8	-15.2
2	2	10	Dallas/Fort Worth, US	73,362,946	17.5	-2.3
3	3	16	Denver, US	69,286,461	17.8	0.4
4	4	6	Chicago, US	68,340,619	26.5	-19.3
5	27	4	Dubai, United Arab Emirates	66,069,981	127.0	-23.5
6	5	3	Los Angeles, US	65,924,298	37.3	-25.1
7	14	28	Istanbul, Turkey	64,289,107	73.8	23.2
8	54	7	London (Heathrow), United Kingdom	61,614,508	217.7	-23.8
9	13	17	New Delhi, India	59,490,074	60.2	-13.1
10	31	9	Paris, France	57,474,033	119.4	-24.5
			Sum of the top 10 airports	679,551,657		

[*1] When an aiport has 1,000 passengers in a year and 1,500 next year, the change in percent is 50.0%.

Table 2

The Change in the Number of International Passengers

Rank			Airport	2022	Change in Percent (%)	
2022	2021	2019			From 2021 to 2022	From 2019 to 2022
1	1	1	Dubai, United Arab Emirates	66,069,981	127.0	-23.5
2	7	2	London (Heathrow), United Kingdom	58,243,060	230.5	-23.4
3	3	3	Amsterdam, Netherlands	52,467,346	105.8	-26.8
4	5	6	Paris, France	51,763,569	128.9	-25.9
5	2	14	Istanbul, Turkey	48,521,725	83.3	22.6
6	4	8	Frankfurt, Germany	44,771,711	97.3	-29.0
7	9	11	Madrid, Spain	36,231,191	136.2	-19.3
8	6	15	Doha, Qatar	35,726,721	101.8	-7.9
9	95	7	Singapore, Singapore	31,902,000	952.9	-52.8
10	55	13	London (Gatwick), United Kingdom	30,145,083	501.5	-30.1
			Sum of the top 10 airports	455,842,387		

Table 3

The Change in the Volume of Cargo (tons)[*2]

Rank			Airport	2022	Change in Percent (%)	
2022	2021	2019			From 2021 to 2022	From 2019 to 2022
1	1	1	Hong Kong, Hong Kong SAR	4,199,196	-16.4	-12.7
2	2	2	Memphis, US	4,042,679	-9.8	-6.5
3	4	6	Anchorage, US	3,461,603	-4.3	26.1
4	3	3	Shanghai, China	3,117,216	-21.7	-14.2
5	6	4	Louisville, US	3,067,234	0.5	9.9
6	5	5	Incheon, Korea	2,945,855	-11.5	6.6
7	7	9	Taipei, Chinese Taipei	2,538,768	-9.7	16.3
8	12	12	Miami, US	2,499,837	-0.8	19.5
9	8	13	Los Angeles, US	2,489,854	-7.6	19.0
10	9	10	Tokyo, Japan	2,399,298	-9.3	14.0
			Sum of the top 10 airports	30,761,540		

[*2] Cargo: loaded and unloaded goods, newspapers, packages, mail, etc.

Table 4

The Change in the Number of Aircraft Movements[*3]

Rank			Airport	2022	Change in Percent (%)	
2022	2021	2019			From 2021 to 2022	From 2019 to 2022
1	1	2	Atlanta, US	724,145	2.3	-19.9
2	2	1	Chicago, US	711,561	4.0	-22.6
3	3	3	Dallas/Fort Worth, US	656,676	0.7	-8.8
4	4	5	Denver, US	607,786	4.6	-3.8
5	7	8	Las Vegas, US	581,116	19.4	5.1
6	6	4	Los Angeles, US	556,913	9.9	-19.4
7	5	7	Charlotte, US	505,589	-2.8	-12.6
8	9	30	Miami, US	458,478	18.2	10.0
9	27	21	New York, US	448,847	54.4	-1.6
10	33	54	Istanbul, Turkey	425,890	52.0	29.1
			Sum of the top 10 airports	5,677,001		

[*3] A movement is a landing or a takeoff of an aircraft at an airport.

The year 2022 was important for air travel's recovery from the impact of the coronavirus pandemic. The four tables above explain the situation in greater detail. Table 1 lists the top 10 airports for the number of passengers (the sum of international and domestic), Table 2 shows the number of international passengers only, Table 3

displays the volumes of cargo（loaded and unloaded goods, packages, mail, newspapers, etc.）, and Table 4 is the number of aircraft movements（landings and takeoffs of aircrafts）.

The top four airports for passenger traffic remained the same as 2021, with Atlanta retaining the top spot in 2022. However, with the exception of Los Angeles, the rest of the top 10 was made up of two groups of airports. The airports in one group were on the list in 2019 but disappeared during the coronavirus pandemic; the airports in the other group, namely [A], were continuing their rapid upward paths in the ranking. Compared to 2021, the biggest jump for the number of passengers was recorded by London（Heathrow）.

From 2021 to 2022, as people started to travel internationally again, the global volume of international passenger traffic increased by 53.5%. Traffic recovered to 73.8% of the 2019 level.

Air cargo volumes in the top 10 airports represent around 27% of the global volumes in 2022. This represents a loss of 9.9% when compared to the 2021 results（but a gain of 4.1% compared to the 2019 results）. Globally, air cargo volumes are estimated to have decreased by 6.7% since 2021（-1.7% from 2019）, to approximately [B] tons in 2022.

The world's airports handled 20.4% more aircraft movements in 2022 than in 2021. This represents a recovery of 82.5% from 2019 levels. The top 10 airports for aircraft movements, which together represent close to 7% of all global traffic, witnessed a gain of 11.4% from their 2021 results. This means a recovery to 91.5% of their 2019 results.

出典：Bates, Joe. "ACI World Traffic Data Reveals the Busiest Airports on the Planet in 2022." *Airport World*, 5 Apr. 2023, https://airport-world.com.
（一部改変）

(1) Choose the airports that best match blank A.

イ Dubai and Istanbul

ロ Istanbul and New Delhi

ハ London（Heathrow）and Paris

ニ Dubai and London（Heathrow）

ホ New Delhi and Paris

(2) Choose the number that best matches blank B.

イ 1.15 million　ロ 11.5 million　ハ 115 million

ニ 1.15 billion　ホ 115 billion

(3) Which airport continuously moved up each year from 2019 to 2022 in the chart on international passengers although it suffered one of the largest losses in the number of passengers?

イ Madrid　ロ London（Heathrow）

ハ Singapore　ニ Istanbul

ホ Paris

(4) Which airport experienced the largest increase in the number of aircraft movements from 2021 to 2022?

イ Atlanta　ロ Las Vegas　ハ Miami

ニ New York　ホ Istanbul

(5) Choose the sentence that matches the text.

イ Globally, there were fewer international passengers in 2022 than in 2021.

ロ Air cargo volumes in the top 10 airports were the highest in 2021, followed by the volumes in 2022, then in 2019.

ハ From 2021 to 2022, the combined number of aircraft movements in the top 10 airports decreased.

ニ In 2022, the world's airports as a whole were better at returning to 2019 levels of aircraft movements than the top 10 airports.

(6) Choose the sentence that matches the content of the tables.

イ Concerning the number of passengers, the difference between Atlanta and Dallas/Fort Worth was larger in 2021 than in 2022.

ロ From 2019 to 2022, Singapore saw a larger decrease in the number of international passengers than Frankfurt.

ハ Concerning domestic passengers, Paris had a larger number than Istanbul in 2022.

ニ The proportion of the top-ranked airport when compared to the 10th airport is the widest in the table for cargo.

問2　下の Figure 1 は，liquid tree と呼ばれる設備の写真である。Figure 1 を見て，この設備に関するつぎの英文を読み，設問に答えよ。

Figure 1.　A Liquid Tree in the Street in Belgrade, Serbia.

Dr. Ivan Spasojevic and his coworker developed an amazing tool for reducing greenhouse gas emissions and improving air quality: the liquid tree.　This new creation, also called LIQUID 3, is a solution in the fight for clean air in Belgrade, Serbia.　One liquid tree contains 600 liters of water and microalgae[*1].　The microalgae [A] out photosynthesis.　In other words, they use sunlight to combine carbon dioxide with water to produce oxygen and sugars.

Trees and grass also [B] photosynthesis.　However, the advantage of microalgae is that they are 10 to 50 times more efficient than trees.　Another strength is that microalgae do not have a problem with the high levels of pollution, unlike many trees that cannot [C] in cities with high levels of pollution, such as Belgrade.　Needless to say, the team behind LIQUID 3 has stated that their goal is not to replace forests or tree planting plans but to use this system to [D] in urban areas where there is no space for planting trees.

The system does not require special maintenance. It creates a kind of waste material called biomass*2 through photosynthesis, and it is enough to [E] the biomass from the microalgae every six weeks. The biomass can be used to enrich soil for farming. With new water and minerals, the microalgae can continue to grow forever.

*1 microalgae: 微細藻類（複数形）

*2 biomass: 動植物などから生まれた有機性資源

出典（写真）：Krieger, Benno. “Liquid Tree to Combat Air Pollution in Belgrade.” *Balkan Green Energy News*, 25 Nov. 2022, https://balkangreenenergynews.com/. （一部改変）

出典（英文）：Daniela Castim Monagas. “A Liquid Tree? Scientists in Serbia Make Incredible Innovation.” *World Bio Market Insights*, 6 Jan. 2022, https://worldbiomarketinsights.com/. （一部改変）

(1) Choose the best word that matches each of the blanks [A] through [E] in the passage. Each word can be used only once.

イ perform　　ロ remove　　ハ fill

ニ survive　　ホ carry

(2) According to the text, what is the advantage of liquid trees over traditional trees?

イ They can survive in heavily polluted areas.

ロ They can create drinking water.

ハ They require no water.

ニ They require no maintenance.

(3) According to the text, what happens to the waste material created by the liquid tree?

イ It is recycled for purifying water and minerals.

ロ It is used to help grow crops.

ハ It is returned to the liquid tree and grows forever.

ニ It is left in the tank of 600 liters of water.

問3 折り紙に関するつぎの英文を読み，設問に答えよ。

The art of origami has existed in Japan since at least the 17th century, but there were hints of paper folding from long before. Initially, models were simple and—because paper was expensive—used largely for ceremonies. As paper prices [A], origami's uses spread to gift wrap, playthings, and even geometry lessons for kids.

Then, in the mid-20th century, origami master Akira Yoshizawa helped advance paper folding to a fine art. He breathed life and personality into each creature he designed, from a serious-looking gorilla to a baby elephant joyfully swinging its trunk*1.

In the years since, the concept of origami has been [B] to many different types of materials. It is now pushing the limits of what scientists think [C] possible, particularly at the tiniest of scales.

Origami holds particular promise for biomedicine. For instance, a team led by Daniela Rus, a professor at Massachusetts Institute of Technology, MIT, developed a robot that can fold to fit into a pill capsule*2. After the capsule is swallowed, the small origami-styled gadget unfolds and can be directed around the body using programmable magnetic fields. An initial test demonstrated one possible use: removing swallowed button batteries from the stomach,

a potentially deadly condition experienced by thousands of children each year. “Imagine using it to deliver medicine or to patch a wound,” Rus says. “Just imagine a future of surgeries with no cuts, no pain, and no risk of infection.”

These types of big dreams are where origami seems to help science flourish most. The respected art form has provided a new tool to awaken the imagination and create technologies once thought impossible, including a boat that folds down small enough to fit in a car’s trunk*3.

*1 trunk: (ゾウの)鼻

*2 capsule: カプセル

*3 trunk: 車のトランク

出典：Wei-Haas, Maya. “Origami Is Revolutionizing Technology, from Medicine to Space.” *National Geographic*, 25 Jan. 2023, https://www.nationalgeographic.com. (一部改変)

(1) 空欄 [A] ～ [C] に当てはまる最も適切な語(句)をそれぞれイ～へから一つ選び，その記号を解答用紙にマークせよ。

A

イ	rise	ロ	rose	ハ	raise
ニ	raised	ホ	fall	ヘ	fell

B

イ	applied	ロ	made	ハ	existed
ニ	progressed	ホ	folded	ヘ	enjoyed

C

イ	be	ロ	being	ハ	is
ニ	are	ホ	it’s	ヘ	they’re

(2) 下線部はどのような意味か。最も適切なものをイ～ニから一つ選び，その記号を解答用紙にマークせよ。

イ Origami Master Akira Yoshizawa promised to provide technology to the biomedical community.

ロ Professor Daniela Rus is working with the biomedical community and has a promising future in teaching origami.

ハ Origami is used for various purposes, and it is especially promising in the biomedical field.

ニ The Origami Society promised that it would create a gadget to remove button batteries swallowed by children.

(3) 本文の内容に関するつぎの説明が本文の内容と一致する場合はＴを，一致しない場合はＦを，それぞれ解答用紙にマークせよ。

① Several hundred years ago, people folded origami paper into various animals with different behaviors and complex expressions.

② Since paper was precious in ancient times, people used it for wrapping presents.

③ Scientists have made origami-like devices which can fold up and be placed in capsules and perform medical functions in the body.

④ Origami has the potential to help the medical field by suggesting alternative solutions to unpleasant surgical operations.

〔Ⅲ〕 つぎの英文は，アメリカの研究者グループが開発した，四肢麻痺（tetraplegia）のある人が操作できるロボットアームに関するものである。これを読み，以下の設問に答えよ。

Think about how often you use your hands to do a task each day. From typing on a computer to picking up a backpack, we rely on our hands to interact with the world around us. However, that's not true for about 170,000 people living in the United States. Because of a spinal cord[*1] injury, they have a condition called tetraplegia. That means they are unable to move or feel anything below the location of their injury, including their arms and legs.

We wanted to allow people with tetraplegia to use a robotic arm to interact with their surroundings, and we developed a brain-computer interface[*2]. A brain-computer interface takes brain signals and translates them into commands for computers. A device then follows these instructions. For example, if the users think about picking up an object with their own arm, the brain-computer interface tells a robotic arm to pick it up.(1)

(2)The first brain-computer interface we made relied on eyesight to operate. The users would control the robot movements based only on what they could see. This brain-computer interface was successful, but it was often slow and did not produce movements as smooth as those of people without tetraplegia.

That's why we developed (3)a new brain-computer interface. This new interface lets the user feel a sense of touch from their own paralyzed hand when touch sensors on the robot hand make contact with an object. We called this interface a bidirectional brain-computer interface because it sends information from and to the brain. We then tested if this extra information improved the user's ability to control the robotic arm.

We implanted four microelectrode arrays[*3] into the brain of a male

study participant. A microelectrode array is a device that contains sensors that record and cause neural signals*4. Neural signals are messages used by the body to communicate information to and from the brain. We placed two arrays in the region of his brain that controls hand and arm movement. These arrays record brain activity and translate it to a control signal for the robotic arm. We placed the other two arrays in the area of his brain that normally receives and interprets information when the hand is touched. Using tiny pulses of electricity, these sensory arrays created neural signals that provide information about when the robotic hand was in contact with an object.

We then asked the participant to complete a set of tasks. He had to use the robotic arm to grasp and pick up eight objects, one at a time. He then placed each object on a platform as quickly as possible. He also had to pick up a cup, pour the contents into another cup, and set the cup back down on the table. We gave each task a score based on how long it took to complete and we calculated a total score for all tasks. The study participant completed the tasks with and without the touch sensor arrays turned on. He had a full view of the robotic arm which was not attached to his body.

The addition of touch feedback (4) improved the study participant's ability to grasp and move objects. The highest possible score for each object in this test of hand and arm function was 3 (on a scale of 0 to 3). Without the touch feedback, the study participant earned the highest score only once. With the touch feedback, he earned the score 15 times. The highest total score possible for moving the eight objects and pouring the contents was 27. The median*5 score without the touch sensors was 17. With the touch feedback, the median score was 21. The difference in score matched the decrease in time. The median time to complete all the tasks without the touch feedback was 20.9 seconds. With the sensors, the time decreased to 10.2 seconds.

The bidirectional brain-computer interface was successful. It improved the participant's ability to pick up and move objects. We measured this by calculating the time it took to complete a task, including grasping the object, lifting it up, and placing it down. We found that the greatest decrease in time occurred during the grasping phase. Without the touch feedback, the study participant spent more time trying to place the hand so he could get a stable grip. It was easier to find this position with touch feedback, similar to the way that we use the sense of touch from our hands to tell us when we have grasped an object.

The success of the bidirectional brain-computer interface inspires more questions for future research. For example, we only used the touch feedback with one study participant. Would a different study participant also show improved task scores? Also, many objects that we used in the tasks were solid. That made it easier for the participant to hold the object once he grasped it. The participant could grasp the object as hard as he needed to. What would happen if the objects were softer or more fragile? We hope that further technological research and new treatments will restore more vital independence to people with spinal cord injuries.

*1 spinal cord: 脊髄

*2 interface: 接続する機能

*3 microelectrode array: 微小な電極群

*4 neural signal: 神経信号

*5 median: 中央値

出典：Collinger, Jennifer L. et al. *Science Journal for Teens*, updated in Feb 2023, https://www.sciencejournalforkids.org. （一部改変）

問1　tetraplegia に関する説明として最も適切なものをイ～ニから一つ選び，その記号を解答用紙にマークせよ。

イ　There are about 170,000 people with tetraplegia in the United States.

ロ　Some of those with tetraplegia have a sense of touch in their arms or legs.

ハ　Some of those with tetraplegia learn to type on computers with their hands.

ニ　Tetraplegia is caused by an injury to the muscles in the neck.

問2　下線部(1) it が指す内容として最も適切なものをイ～ニから一つ選び，その記号を解答用紙にマークせよ。

イ　their own arm　　ロ　an object

ハ　the brain-computer interface　　ニ　a robotic arm

問3　下線部(2) the first brain-computer interface に関する説明として最も適切なものをイ～ニから一つ選び，その記号を解答用紙にマークせよ。

イ　The user was able to operate the robotic arm smoothly.

ロ　The user was able to control two robotic arms.

ハ　Though the user could experience a sense of touch, it was not strong enough.

ニ　The movements were often awkward.

問４　下線部(3) a new brain-computer interface を用いた実験に関する説明として最も適切なものをイ～ニから一つ選び，その記号を解答用紙にマークせよ。

イ　The participant could not only see an object but could also experience a sense of touch.

ロ　The participant could control two robotic arms.

ハ　The participant could experience a sense of touch when his hand contacted an object.

ニ　The participant could experience a sense of heat and cold when his hand contacted an object.

問５　下線部(3) a new brain-computer interface は，その信号伝達が双方向に及ぶことから bidirectional brain-computer interface とも呼ばれている。この信号伝達が行われる箇所を伝達の順番に並べたものとして最も適切なものをイ～ニから一つ選び，その記号を解答用紙にマークせよ。

(A)　a robotic arm

(B)　the region of the brain that controls hand and arm movement

(C)　the region of the brain that normally receives and interprets information when hand touches something

(D)　two arrays of electrodes that sense the contact with an object and create signals to give a sense of touch

(E)　two arrays of electrodes that record brain activity and generate a control signal

イ　C → D → A → E → B

ロ　C → E → A → D → B

ハ　B → E → A → D → C

ニ　B → D → A → E → C

問６　下線部(3) a new brain-computer interface を用いて行った実験の方法として本文中で述べられている事柄はどれか。最も適切なものをイ～ホから一つ選び，その記号を解答用紙にマークせよ。

イ　The participant did ten tasks.

ロ　The participant grasped and picked up eight objects at once.

ハ　The participant was able to see all of the robotic arm.

ニ　The participant poured half of the contents of a cup into another cup.

ホ　The participant picked up objects and put them into a cup.

問７　下線部(3) a new brain-computer interface を用いて行った実験の結果やその評価方法として本文中で述べられていない事柄はどれか。イ～ホから一つ選び，その記号を解答用紙にマークせよ。

イ　Each task was rated on a scale from 0 to 3, giving the participant a maximum of 3 points in each task.

ロ　The addition of touch feedback helped the participant receive the highest score 15 times.

ハ　The median score without the touch sensors was 17, and 21 with the touch feedback.

ニ　In calculating task scores, accuracy was more important than time to complete the tasks.

ホ　With touch feedback, the median time to complete the tasks decreased to less than half.

問８　下線部(4) touch feedback を導入した実験では，どのような結果が得られたか。touch feedback がない実験と比べた考察として最も適切なものをイ～ニから一つ選び，その記号を解答用紙にマークせよ。

イ　The score improved the most in the task with a cup.

ロ　It became easier to grab an object.

ハ　It became difficult to find a stable grip.

ニ　The step of putting things down contributed the most to the decrease in time.

問９　本文の内容にもとづいて，今後の研究におけるさらなる課題として最も適切なものをイ～ニから一つ選び，その記号を解答用紙にマークせよ。

イ　whether adding other senses to touch feedback will improve task scores

ロ　whether grasping will be more difficult if the objects are softer or more fragile

ハ　whether controlling three or more robotic arms will be possible

ニ　whether more microelectrode arrays will improve task scores

問10　本文のタイトルとして最も適切なものをイ～ニから一つ選び，その記号を解答用紙にマークせよ。

イ　Will Robots Replace Human Labor?

ロ　Will Tetraplegia Be Completely Curable in the Future?

ハ　Can a Robotic Arm Control a Human Arm?

ニ　Can a Robotic Arm Be Controlled by the Brain?

〔Ⅳ〕 二進数表現（binary expression）の原理を説明したつぎの英文を読んで，以下の設問に答えよ。なお文章には［1］～［8］の段落番号が付されている。

著作権の都合上，省略。

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著作権の都合上，省略。

著作権の都合上，省略。

*1 wattage: ワット数

*2 flip: スイッチをオンもしくはオフする

出典：Gates, Bill. *The Road Ahead*. Viking Penguin, 1995. （一部改変）

問１　下線部の発音が下線部(1)と異なるものをイ～ニから一つ選び，その記号を解答用紙にマークせよ。

イ　You can use the bottle again. It's more ecological.

ロ　Can you find a good use for these cardboard boxes?

ハ　I'm not used to riding a packed train yet.

ニ　My grandmother used to play tennis a lot with her friends.

問２　下線部(2)と同じ意味で once が使われている文をイ～ニから一つ選び，その記号を解答用紙にマークせよ。

イ　I visit my grandfather once a month.

ロ　"A thinking computer" was once considered impossible.

ハ　Once you learn how to ride a bicycle, you never forget.

ニ　Once a center of steel industry, the city is now famous for great museums.

問３　次の(1)および(2)は，本文中のある段落の末尾から抜き出した文である。どの段落の末尾に入れるのが適切か，それぞれ段落番号［１］～［８］から一つ選び，その記号を解答用紙にマークせよ。

(1) This may seem like a complicated way to describe the brightness of a light source, but it is an example of the theory behind binary expression, the basis of all modern computers.

(2) In other words, analog information can be gathered, stored, and reproduced, but it tends to be imprecise and runs the risk of becoming even less precise each time it is transferred.

問４　本文の内容に関するつぎの説明が本文の内容と一致する場合はＴを，一致しない場合はＦを，それぞれ解答用紙にマークせよ。

(1) By turning the knob in Figure 1, it is easy to reproduce the same wattage.

(2) With the system described in Figure 2, all the switches are half the wattage of their left light bulb, except the light bulb on the far left side.

(3) When the message is in the form of binary expression, the same information can be shared among a million people.

(4) In the binary expression explained in this text, 0 represents “on” and 1 represents “off.”

問５　本文の内容にもとづいて次の問いに答えるとき，on と off の並びとして最も適切なものをイ～ニから一つ選び，その記号を解答用紙にマークせよ。

Which of the following patterns of on/off switches makes 200 watts of light?

イ　on, off, off, off, off, off, off, off　　ロ　on, off, off, off, on, off, on, off

ハ　on, on, off, off, off, off, off, on　　ニ　on, on, off, off, on, off, off, off

問6　binary expression の説明として最も適切なものをイ～ニから一つ選び，その記号を解答用紙にマークせよ。

イ　It is a physical quantity that represents the number of light bulbs.

ロ　It is a way of representing numerical values where only two symbols are used.

ハ　It is a way of treating a signal that has a continuous value.

ニ　It is a system of secret codes that uses the intensity of light.

問7　以下の文章は本文全体を要約したものである。空欄 [A] ～ [C] に入る語の組み合わせとして最も適切なものをイ～ニから一つ選び，その記号を解答用紙にマークせよ。なお，文頭の大文字・小文字は問わない。

This article discusses the differences between analog and digital methods of storing and transmitting information, using the example of lighting a room. [A] information is not as precise and can become less accurate when transferred, whereas [B] information is more accurate, because it can be converted into easily transferable [C] numbers and stored as long strings of bits. With such a system to control a series of light bulbs, an exact lighting level can be produced and communicated to others. This is an example of the theory behind binary expression, the basis of all modern computers.

	A	B	C
イ	analog	digital	binary
ロ	analog	analog	binary
ハ	binary	digital	digital
ニ	digital	binary	analog

問８　本文のタイトルとして最も適切なものをイ～ニから一つ選び，その記号を解答用紙にマークせよ。

イ　The Principle of Lightning Control

ロ　The Analog Information Is the Foundation of Digital System

ハ　Differences between Switches and Knobs

ニ　How to Describe Information in Digital Form