令和７年度　九州産業大学大学院入学試験問題用紙（秋期）

情報科学研究科 情報科学専攻 博士前期課程　　入試区分：一般入試

次頁以降の英文を読み、以下の設問に答えなさい。解答は、すべて解答用紙に記入すること。

設問１．下線部を和訳しなさい。

Question 1: Translate the underlined sentence into Japanese.

設問２．二重下線部を和訳しなさい。

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Question 3: Choose the best words for the blanks (1) and (2) out of (A)~(D) given below to complete the sentences.

（１）の選択肢

(A) and　(B) as　(C) from　(D) but

（２）の選択肢

(A) on　(B) with　(C) out　(D) in

設問４．次の文が本文の内容と合っていれば “True”、合わなければ “False” を書きなさい。

Question 4: If each of the following sentences matches the content of the article, write “True”; if not, write “False”.

（１）AI は明示的にプログラムされずに学習ができる機械学習の一分野である。

答え/Answer: _____

（２）ディープラーニングは機械学習の一種であり AI の機能を進歩させた。

答え/Answer: _____

（３）AI は生活の仕方に革命をもたらす可能性を秘めた強力なツールである。

答え/Answer: _____

（４）研究者や技術者は利益のためには倫理的な悪影響は仕方ないと考える。

答え/Answer: _____

以下の設問に英語で答えなさい。
Answer the following questions in English.

設問５．本文中で挙げられているコンピュータビジョンの応用例を列挙しなさい。

Question 5: List the applications of computer vision mentioned in the text.

_____

設問６．本文中で挙げられている急速に進歩した AI が近年広く採用されている業界を列挙しなさい。

Question 6: List the industries that AI adopted widely mentioned in the text.

_____

試験科目	英　語

Artificial Intelligence, commonly known as AI, is a branch of computer science that focuses on creating intelligent machines capable of performing tasks that typically require human intelligence. These tasks include learning from experience, recognizing patterns, understanding natural language, making decisions, and solving problems. AI systems are designed to mimic human cognitive functions such (1) reasoning, problem-solving, perception, and learning, with the goal of enabling machines to perform tasks efficiently and autonomously.

One of the key components of AI is machine learning, a subset of AI that enables computers to learn from data without being explicitly programmed. Machine learning algorithms use statistical techniques to identify patterns in data and make predictions or decisions based on these patterns. Deep learning, a type of machine learning that uses artificial neural networks to model complex patterns in large amounts of data, has significantly advanced the capabilities of AI systems in recent years.

Natural language processing (NLP) is another important subfield of AI that focuses (2) enabling machines to understand, interpret, and generate human language. NLP technologies power virtual assistants like Siri and Alexa, language translation services, and sentiment analysis tools used in social media monitoring.

Computer vision is a branch of AI that enables machines to interpret and understand visual information from the real world. Computer vision algorithms can analyze and extract information from images and videos, enabling applications such as facial recognition, object detection, and autonomous driving systems.

AI is also closely related to robotics, where intelligent machines are designed to interact with the physical world and perform tasks autonomously. Robotics combines elements of AI, machine learning, and mechanical engineering to create robots that can perform a wide range of tasks, from manufacturing to healthcare and exploration.

In recent years, AI technologies have seen rapid advancements and widespread adoption across various industries, including healthcare, finance, retail, transportation, and entertainment. AI-powered systems are being used to improve efficiency, accuracy, and decision-making in a wide range of applications, from diagnosing diseases to predicting consumer behavior.

Despite the immense potential of AI to transform industries and improve human lives, there are also concerns about ethical issues such as bias in AI algorithms, privacy concerns related to data collection, and the potential impact of AI on jobs and society. Addressing these challenges requires a thoughtful and responsible approach to the development and deployment of AI technologies.

Overall, AI represents a powerful tool that has the potential to revolutionize how we work, communicate, and live. As researchers and engineers continue to push the boundaries of AI technology, it is essential to consider the ethical implications and ensure that AI systems are designed and used in ways that benefit society as a whole.

出典：Vanne, Sliver. Python Artificial Intelligence: Unlock The Power of AI with Python Programming, Machine Learning, Deep Learning, and Neural Networks (Basic Programming languages Book 13)

試験科目	英語

令和７年度　九州産業大学大学院入学試験問題用紙（秋期）

情報科学研究科 情報科学専攻 博士前期課程　　入試区分：一般入試・外国人留学生入試

D-1

整列済の配列に対し 2 分探索を適用したい。2 分探索では、ターゲットとなる要素が存在すればその配列上の位置を返却し、配列中に存在しない場合は-1 を返却するものとする。

Suppose we want to perform binary search on a sorted array of elements, returning a position in the array if the target element appears in the array, otherwise -1.

(1) 図 1 に 2 分探索の関数 search()を示している。この関数は整列済の配列*array*、配列の要素数*n*、ターゲットとなる要素*t*を入力とする。この疑似コードを完成させよ。なお、floor () は引数となる実数*x*以下となる最大の整数を出力する関数のことである。

The binary search function named search () is shown in Fig. 1. The function takes as input a sorted array "*array*", the array size n and the target element t. Complete the pseudo code. In Fig. 1, floor() is the function that takes as input a real number x, and gives as output the greatest integer less than or equal to x.

```
function search (array, n, t)
        low = 0                 /* lower bound of search space */
        high = [ a ]            /* upper bound of search space */
        while [ b ] do
                mid = floor( (low + high) /2 )
                if array[mid] == t then
                        return mid
                else if array[mid] < t then
                        low = [ c ]
                else
                        high = [ d ]
        end
        return -1
end
```

図1 (Fig. 1)

(2) search()関数を以下のように呼び出した場合の探索の様子を示せ。表1を埋めること（全ての行を埋めなくてもよい）。

Trace the search results from the following function call by filling in Table 1. Note that you might not need to fill in all the rows.

data = {4, 12, 22, 33, 47, 55, 60, 76, 81, 92}

search(data, 10, 60)

表1 (Table 1)

low	high	mid	array[mid]
0	9	4	47

(3) 2分探索において、整列済の配列の要素数が32であるときの最大探索回数を求めよ。

In a binary search, what is the maximum number of comparisons required to search a sorted array of 32 elements?

試　験 科　目	情報科学基礎 「データ構造とアルゴリズム」

D-2

ダイクストラ法は最短経路を求めるアルゴリズムである（図 2 はその疑似コード）。また、図 3 は頂点a～fを含む重み付きグラフGの隣接行列を表している。このアルゴリズムをグラフGに適用するとき、次の問いに答えよ。

Dijkstra's algorithm is an algorithm for finding the shortest paths in a graph (Fig. 2 shows the pseudo code for Dijkstra's algorithm). Consider an adjacency matrix shown in Fig. 3 representing a weighted graph G containing nodes a through f. Answer the following questions when applying Dijkstra's algorithm to the graph G.

A pseudo code for Dijkstra's algorithm:

```
Initialize the label of each node to unknown
Initialize the cost of each node to ∞
Initialize the cost of the source to 0
While there are unknown nodes left in the graph
    Select an unknown node V with the lowest cost
    Mark V as known
    for each neighbor U of V
        U's cost = min(U's old cost, V's cost + cost of (V, U))
```

図2 (Fig. 2)

	a	b	c	d	e	f
a	0	5	0	0	2	0
b	0	0	0	0	0	0
c	0	4	0	5	0	0
d	0	0	0	0	0	0
e	0	2	4	0	0	3
f	0	0	2	4	0	0

図3 (Fig. 3)

(1) **図3の隣接行列で表された重み付きグラフGを描け。**
Draw the graph G resulting from the adjacency matrix in Fig. 3.

(2) **頂点aから頂点dへの最短経路及びその距離を示せ。**
Write the shortest path and the distance from the initial node a to node d.

(3) **(2)で最短経路が見つかる頂点の順（最短経路が確定した順）を示せ。**
Write the sequence of "*known*" nodes during finding the shortest path in question (2).

(4) **頂点aからすべての頂点への最短経路を表現する全域木（最短経路木）を示せ。**
Draw the spanning tree (the shortest path tree) of G that includes all the shortest paths from node a.

令和７年度　九州産業大学大学院入学試験問題用紙（春期）

情報科学研究科 情報科学専攻 博士前期課程　　入試区分：一般入試

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設問４．次の文が本文の内容と合っていれば “True”、合わなければ “False” を書きなさい。

Question 4: If each of the following sentences matches the content of the article, write “True”; if not, write “False”.

（１）金融システムは完全にコンピュータ化されている。

答え/Answer: _____

（２）ソフトウェアシステムは物理的な制限がないため、急速に複雑になり、理解が困難になることがある。

答え/Answer: _____

（３）異なる種類のソフトウェアでも同じソフトウェア工学の手法と技術が必要である。

答え/Answer: _____

（４）ソフトウェア工学は、現代のソフトウェア開発には不十分である。

答え/Answer: _____

以下の設問に英語で答えなさい。
Answer the following questions in English.

設問５．本文中でソフトウェア集約型であるとされているエンターテイメントの種類を列挙しなさい。

Question 5: List the types of entertainment that are mentioned in the text as being software-intensive.

_____

設問６．本文中で挙げられているソフトウェアプロジェクトの失敗要因を列挙しなさい。

Question 6: List the factors of software project failure mentioned in the text.

_____

試験科目	英　語

Software Engineering is essential for the functioning of government, society, and national and international businesses and institutions. We can't run the modern world without software. National infrastructures and utilities are controlled by computer-based systems, and most electrical products include a computer and controlling software. Industrial manufacturing and distribution is completely computerized, as is the financial system. Entertainment, including the music industry, computer games, and film and television, is software-intensive. More than 75% of the world's population have a software-controlled mobile phone, and, by 2016, almost all of these will be internet-enabled.

Software systems are abstract and intangible. They are not constrained (1) the properties of materials, nor are they governed by physical laws or by manufacturing processes. This simplifies software engineering, as there are no natural limits to the potential of software. However, because of the lack (2) physical constraints, software systems can quickly become extremely complex, difficult to understand, and expensive to change.

There are many different types of software system, ranging from simple embedded systems to complex, worldwide information systems. There are no universal notations, methods, or techniques for software engineering because different types of software require different approaches. Developing an organizational information system is completely different from developing a controller for a scientific instrument. Neither of these systems has much in common with a graphic-intensive computer game. All of these applications need software engineering; they do not all need the same software engineering methods and techniques.

There are still many reports of software projects going wrong and of "software failures." Software engineering is criticized as inadequate for modern software development. However, in my opinion, many of these so-called software failures are a consequence of two factors:

1. *Increasing system complexity* As new software engineering techniques help us to build larger, more complex systems, the demands change. Systems have to be built and delivered more quickly; lager, even more complex systems are required; and systems have to have new capabilities that were previously thought to be impossible. New Software engineering techniques have to be developed to meet new the challenges of delivering more complex software.
2. *Failure to use software engineering methods* It is fairly easy to write computer programs without using software engineering methods and techniques. Many companies have drifted into software development as their products and services have evolved. They do not use software engineering methods in their everyday work. Consequently, their software is often more expensive and less reliable than it should be. We need better software engineering education and training to address this problem.

出典：Ian Sommerville. Software Engineering, Tenth Edition, Global Edition, 2016. Pearson Education Limited, ISBN-13: 978-1-292-09613-1.

試験科目	英　語

令和７年度　九州産業大学大学院入学試験問題用紙（春期）

情報科学研究科 情報科学専攻 博士前期課程　　入試区分 ： 一般入試

1.

$$A=\begin{bmatrix} 1 & 0 & 2 & -1 & 2 \\ 2 & 1 & 3 & -1 & -1 \\ -1 & 3 & -5 & 4 & 1 \end{bmatrix}$$ とする.

（1）行列Aの階数を求めよ.　(Find the rank of matrix A.)

（2）連立１次方程式　$A\boldsymbol{x}=\boldsymbol{0}$　$(\boldsymbol{x}\in\boldsymbol{R}^5)$　の解空間の次元と１組の基を求めよ.
(Find the dimension and a basis of the solution space of the following simultaneous linear equations $A\boldsymbol{x}=\boldsymbol{0}$ $(\boldsymbol{x}\in\boldsymbol{R}^5)$.)

（3）行列Aの列ベクトルの１次独立な最大個数ｒとｒ個の１次独立なベクトルを１組求め，他のベクトルをこれらの１次結合で表せ.
(Find the maximum number r of the linearly independent column vectors of A and these r vectors, and express the other vectors as a linear combination of them.)

（4）次の線形写像Tを考える.　(Consider the following linear mapping T.)

$T:\boldsymbol{R}^5\to\boldsymbol{R}^3$,　$T(\boldsymbol{x})=A\boldsymbol{x}$

（a）Tの核の次元と１組の基を求めよ.
(Find the dimension and a basis of the kernel of T.)

（b）Tの像の次元と１組の基を求めよ.
(Find the dimension and a basis of the image of T.)

2.

$$A=\begin{bmatrix} 7 & -6 \\ 3 & -2 \end{bmatrix}$$ とする.

（1）行列Aの固有値を求めよ.
(Find the eigenvalues of the matrix A.)

（2）各固有値の固有空間を求めよ.
(For each eigenvalue of the matrix A, find the eigenspace corresponding to it.)

（3）行列Aを対角化せよ.
(Diagonalize the matrix A.)

（4）A^nを計算せよ.
(Calculate A^n.)

試　験 科　目	情報科学基礎 (線形代数学)