2025 Master's Program, Graduate School of Design (General Entrance Examination) Achievement Test Question and Answer Sheets

Examination Subject
Human Life Design and Science

Examinee's number

In addition to the following two compulsory questions (100 points in total), select two elective questions from page 3 to page 16 (50 points each), and answer four questions in total.

< Compulsory Question – 1 >

Select three terms from the following keyword group and describe their roles in changing human life due to climate change in about 400 words. In your answer, underline the three words you selected. <60 points>

Keyword Group: Industrial Design, Advertising, Aging Society, Kansei (sensibility), Science and Technology, Inclusive Design, Environmental Adaptability, Simulation, Creativity

Intent of the question

This question tests the ability to logically compose a long text on the subject of changing human life due to climate change, while appropriately using key words related to the Human Life Design and Science course.

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< Compulsory Question – 2 >

Select five terms from the following keyword group and explain each in about 40 words <40 points, 8 points each>

Keyword Group: Maximum Likelihood Estimation (MLE), Erect Bipedalism, Paid Publicity, Cortisol, Personal Space, Photoreceptor Cell, Bearing, Wicked Problem, White Cube, Disuse Syndrome, Affordance, Minimal Group Paradigm, Public Art, Least Squares Method (LSM), Power Transmission Device, Anthropometry, Synapse, Procedural Justice

Selected Keyword 1 [ ]

Selected Keyword 2 [ ]

Selected Keyword 3 [ ]

Selected Keyword 4 [ ]

Selected Keyword 5 [ ]

Intent of the question

The purpose of this question is to check your understanding of knowledge regarding the entire subject area of the Human Life Design and Science. The evaluation will focus on whether the applicant can provide accurate and specific explanations based on the specified number of words.

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< Elective Question – 1 >

Explain and elaborate how you would design an experiment to study gender differences in the recognition of human facial expressions using EEG measurements and cognitive tasks. (at least 300 words) <50 points>

Intent of the question

This question is designed to test your understanding of experimental methods using brain waves on human participants. It tests the understanding of the points to note when measuring brain waves (the need for an environment or processing that reduces internal or external noise due to the small amplitude of signal), the indicators that can be measured using brain waves (frequency power, event-related potential), and your knowledge of how to plan and analyze experiments in accordance with experimental design methods. It will also be awarded points for the description of the experimental preparation situation, such as ethical applications.

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< Elective Question – 2 >

Explain the circulatory and metabolic responses to long-duration jogging (slow running). (at least 300 words) <50 points>

Intent of the question

In Human Factors and Ergonomics, in order to measure and evaluate the physical burden on the human body during physical activity, it is necessary to understand the basic physiological responses, particularly those related to circulation and metabolism. In this question, using prolonged moderate-intensity physical activity as an example, examinees are asked to explain the characteristics of aerobic metabolism and cardiovascular responses.

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< Elective Question – 3 > (You may also use the following sheet to answer. Do not use the back side.)

We consider the transmission of an infectious disease using probabilities. This infection is assumed to occur with probability β when a nonimmune non-infected person ("*susceptible person*") and an infected person dine together. Besides, assume that no infection occurs when infected or susceptible persons dine with each other. Suppose that the ratio of infected people in a city where Mr. A lives is α $(0 < \alpha < 1)$, then the probability that a person who lives in the city is infected is α. <50 points>

(1) Suppose that Mr. A is found to be infected after a dinner with an infected person. Answer the probability that Mr. A got infected by the dinner using α, β.

(2) Suppose that Mr. A is found to be infected after a dinner with one of his friends who lives in the same city. Answer the probability that Mr. A got infected by the dinner using α, β.

(3) Suppose that Mr. A is found to be infected after Mr. A had dinner with n friends who lived in the same city one by one in turn. Answer the probability that Mr. A got infected by the series of dinner using α, β, n.

Intent of the question

This question uses infectious diseases as the subject matter to test the ability to properly formulate the actual phenomenon and to calculate the desired probabilities using the fundamentals of probability theory. It will be also focused on the ability to communicate using mathematical formulae, such as whether the variables used in the solution process are properly defined.

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< Elective Question – 3 > Answer sheet (continued)

Do not write on the back side of the answer sheet, or your answers will not be marked.

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< Elective Question – 4 >

Describe your views on the importance of storytelling in advertising expression, with specific examples. <50 points>

Intent of the question

* Provide a basic knowledge of the role and effectiveness of storytelling, and consider its effectiveness as an advertising strategy.
* Provide specific examples of advertisements and explain their importance theoretically.
* Clarify the applicant's own ideas in a logical and persuasive manner.
* Show the applicant's original point of view on new possibilities and challenges.

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< Elective Question – 5 >

Describe natural selection in evolution. Explain an example of a phenotype in humans that is likely to have been subject to positive natural selection, including the reasons for this natural selection. (at least 300 words) <50 points>

Intent of the question

This question assesses basic knowledge of natural selection, a key factor in physiological anthropology that relates to human evolution and adaptation. It also evaluates whether students can provide examples of how diverse human phenotypes may have arisen due to natural selection and offer a theoretical explanation of the relationship between selection pressure and phenotypes.

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< Elective Question – 6 >

Outline the circulatory regulatory responses when changing position from supine to standing and explain the reasons for the increased prevalence of orthostatic hypotension in hot weather. (at least 300 words) <50 points>

Intent of the question

This question tests basic knowledge of human physiology regarding physiological responses to postural changes and heat stress, as well as the ability to logically examine and explain the circulatory regulation mechanisms when these factors are combined

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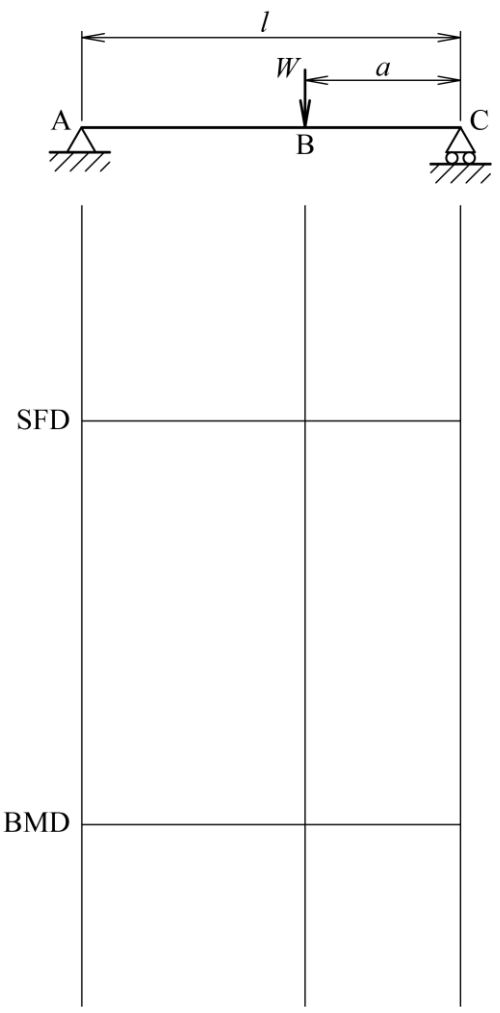
< Elective Question – 7 > (You may also use the following sheet to answer. Do not use the back side.)

The designed bench was modeled as a beam as shown in the figure. It shows a person with weight W sitting in point B on the bench. The length of the beam is as shown in the figure. Answer the following questions. Note that modulus of longitudinal elasticity (Young's modulus) is E, the cross-sectional area is A, the moment of inertia of area is I, and the section modulus is Z (not all of these variables may be necessary for the answer). In addition, neglect the weight of the beam. <50 points>

(1) Determine the size of the reaction forces R_A, R_C at point A and C and their directions.

(2) Draw the shearing force diagram (SFD) and bending moment diagram (BMD), and find the maximum bending moment M_{max} between A and C. In addition, show the derivation process.

(3) Determine the maximum stress σ_{max} in the beam and its location with as much detail as possible.



Intent of the question

This question assesses your ability to determine and draw the shearing force diagram (SFD) and bending moment diagram (BMD) due to loads acting on a statically determinate structure, as well as your understanding and ability to analyze stress distribution in structures. In particular, we emphasize the ability to identify the location of maximum bending moment and where maximum stress occurs. Through this question, we aim to confirm whether you have acquired the fundamental mechanical knowledge necessary for evaluating the safety of structures in actual design and analysis.

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< Elective Question – 7 > Answer sheet (continued)

Do not write on the back side of the answer sheet, or your answers will not be marked.

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< Elective Question – 8 >

According to the American philosopher Charles Sanders Peirce, the inference we conduct in our daily lives can be classified into deduction, induction, and abduction. Deduction is a type of inference that derives particular conclusions from general and universal propositions or laws based on logical forms. Induction is inference that derives general propositions or laws from individual concrete empirical cases. Abduction is a type of reasoning that involves coming up with a plausible hypothesis as an explanation for a surprising fact. Please answer the following questions. <10 points + 40 points = 50 points>

1. Please explain a specific example of induction. <10 points>

2. How can learning about these types of reasoning be useful when designing products? Discuss your thoughts. <40 points>

Intent of the question

This problem aims to assess whether you have a fundamental understanding of Charles Sanders Peirce's classification of reasoning and to evaluate your ability to logically explain how this knowledge can be applied in design practice. Specifically, it examines your capacity to discuss the characteristics and interrelationships of deduction, induction, and abduction, as well as the effectiveness and applicability of combining different reasoning methods, by connecting them to concrete examples.

< Elective Question – 9 >

Appropriateness-evaluation of behavior is a crucial concept in the context of individual's social adaptation since it reflects the understanding of the social norm in the respective society. Deviations in the appropriateness-evaluation of behavior are perceived as deviations from those social norms, which can ultimately lead to social exclusion within a closed community. Answer to the queries (1) to (3) in accordance with the following assumptions and hypotheses about appropriateness-evaluation of interpersonal behaviors under social conflicts. <50 points>

■ Premises

Criteria for evaluating the appropriateness of interpersonal behavior

Whether it is a rational choice of action aiming at a social state that improves the benefits of all members of society.

Social conflict structures

Exchanging conflict: A behavior that results in a benefit (loss) for oneself causes a loss (benefit) for the other.

Coordination conflict: Someone must lose relatively in order to make a decision to improve the benefits of all members of society.

Social relationships

Irreplaceability: Degree of social mobility.

Hierarchical roles: Existence of distinct roles that should accept the hierarchical disparity in benefits.

■ Hypotheses

The conflict resolution strategies that people evaluate as appropriate are distinguished based on two perspectives: social conflict structure and social relationship.

- Under exchanging conflict situations, altruistic behavior in a society with low social mobility, whereas reciprocal behavior in a society with high social mobility.
- Under coordination conflict situations, submissive behavior toward superiors, whereas behavior based on logic and correctness toward others without clear hierarchical roles.

(1) Select and circle three options that are logically consistent with the hypothesis above.

Answer: A, B, and E

A. The roles of authority and submissiveness are efficient within the scope of the roles' efficacy, in that they obviate the need for debate about behavioral choices.

B. Unconditional cooperation is an adaptive strategy for the member of closed community, where the probability of survival outside the community is low and social relationships are highly irreplaceable.

C. Under exchanging conflict situations, a strategy that aims at maximizing individual benefit is effective in order to maximize the benefit of all members of a society.

D. A strategy to avoid conflicts by accepting external norms (e.g. logicality) is effective only where social roles are clear between the parties involved.

E. In a society with high mobility, the strategy of cooperating as long as the counterparts cooperate is adaptive, which enables to initiate an immediate relationship with resource holders.

(2) Based on the hypothesis above, name a <u>concrete</u> example of interpersonal behavior that would be evaluated as appropriate by people with the assumed conflict situation, and indicate the reason for it.

Assumed conflict situation and interpersonal behavior: _____

Reason: _____

Intent of the question

This question assesses the ability to understand the presented abstract concepts and judgment frameworks, as well as the ability to accurately apply the given hypotheses to specific situations.

(3) Give possible reasons why people might not evaluate the behavior (2) as appropriate even if the hypothesis is valid.

_____

Intent of the question

This question assesses the ability to logically examine the limitations of the hypothesis.

Ref.) H. Shimizu, K. Kosugi, Appropriateness-evaluation of interpersonal actions, and social norm: A formulation of Socio-Logics, The Japanese Journal of Experimental Social Psychology, vol.49(2), 2010

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< Elective Question – 10 >

Answer the names of the five urban environmental installation classification systems listed below and explain any design and installation considerations using the words specified. <10 points x 5 questions = 50 points>

1. dust-box
Classification system name:
Explanation of design and installation considerations. 【specified words】Timing of refuse collection, sorting, garbage disposal point, damage from crows, etc.
2. kiosk
Classification system name:
Explanation of design and installation considerations. 【specified words】Temporary and permanent installations, traction, food and beverage, energy equipment
3. Tourist information signs
Classification system name:
Explanation of design and installation considerations. 【specified words】Digital signage, guide signs, placement, maintenance
4. bus stop
Classification system name:
Explanation of design and installation considerations. 【specified words】Maintenance, advertising revenue, route maps, adjacent street furniture
5. bench
Classification system name:
Explanation of design and installation considerations. 【specified words】Single-seat, row-seat, unit, material

Intent of the question

This question checks whether the candidate has basic knowledge of street furniture, which is the main design target of public design. In this question, the candidate is asked to give answers about specific objects and the issues that should be considered when designing and installing them. This allows us to see what kind of phenomena each object is thought to be related to, and what kind of impact the object is thought to have on the place and users. From the above, we can see whether the respondent has an understanding and interest in the design field, and whether they can think about not only the design object but also related issues.

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< Elective Question – 11 >

Elaborate and explain the design dimensions for chairs in the waiting area of a general hospital based on human body anthropometry of the people visiting the hospital. (at least 300 words) <50 points>

Intent of the question

This question aims to assess the candidate's fundamental understanding of product design based on ergonomics. In particular, it evaluates the comprehension of utilizing anthropometric data, the importance of considering the characteristics of target users (such as patients and the elderly), and awareness of comfort and safety in public spaces.

Additional credit may be given if the response refers to specific design dimensions (such as body dimensions, object dimensions, and clearance allowances) or includes considerations for elderly individuals or those with physical limitations (e.g., seat height, seat depth, presence of armrests). Since actual product design should account for user diversity and incorporate a universal design perspective, referencing these aspects will be taken into account in the evaluation.

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< Elective Question – 12 >

What is circadian rhythm and what are the consequences of disrupting it? Explain what we need to be careful of in our daily lives to prevent disruptions to our circadian rhythm. (at least 300 words) <50 points>

Intent of the question

Understanding the physiological characteristics of human behaviour is important for designing well-being. This question focuses on circadian rhythms and sleep as an example. In today's 24-hour information society, many studies have shown that circadian rhythms and sleep are disrupted in people of various ages and occupations and that this impacts human health. This question aims to test the ability to understand this current situation and to describe solutions logically based on scientific evidence.