

2024학년도 편입학전형

필답고사 문제지 (자연계열 II)

[필답고사 시간 14:00 ~ 15:30, 수학 20문항, 영어 20문항]

모집단위	학부·과	지원전형 (일반/학사)	
수험번호		성명	

【 수험생 유의사항 】

1. 답안지에 지원학부(과), 지원전형, 성명, 생년월일, 수험번호를 정확하게 기재할 것
2. 수험번호, 주민등록번호 앞자리, 답안 마킹란에는 반드시 검정색 컴퓨터용 사인펜을 사용할 것
(수험생기재란 및 수험번호의 글자 및 숫자 작성은 흑색 볼펜 등을 사용해도 무방)
3. 마킹을 바르게 표기할 것(답안지 내 수험생 유의사항 확인)
4. 감독관 날인이 없는 답안지는 무효처리됨
5. 답안지에 답 이외의 특정 표시 불가(단, 수정테이프 사용 가능)
6. 답안지 훼손이나 낙서 등으로 판독이 불가능할 경우 해당 답안지는 0점 처리하며 그 책임은 수험생 본인에게 있음
7. 자연계열 II 모집단위: 전자전기컴퓨터공학부, 통계학과, 생명과학과, 환경원예학과, 융합응용화학과, 도시공학과, 환경공학부, 건축학부 건축학전공



서울시립대학교
UNIVERSITY OF SEOUL

1. 곡선 $\ln(x^2+y^2)-xy^2=0$ 위의 점 $(0, 1)$ 에서 접선의 기울기는? [2점]

- ① $-\frac{3}{2}$ ② $-\frac{1}{2}$ ③ 0 ④ $\frac{1}{2}$ ⑤ $\frac{3}{2}$

2. 급수가 다음을 만족할 때, $a+10b$ 의 값은? [2점]

$$(가) \sum_{n=0}^{\infty} \frac{(-1)^n \pi^{2n+1}}{6^{2n-1} (2n+1)!} = a$$

$$(나) \sum_{n=2}^{\infty} \frac{\sqrt{n+5} (3x-1)^n}{21^n \ln n} \text{의 수렴 반지름은 } b \text{이다.}$$

- ① 78 ② 88 ③ 92 ④ 96 ⑤ 98

3. 정적분 $\int_0^1 \frac{3x^2}{\sqrt{4-x^2}} dx$ 의 값은? [2점]

- ① $\frac{\pi}{2} - \frac{3\sqrt{3}}{2}$ ② $\frac{\pi}{2} + \frac{3\sqrt{3}}{2}$ ③ $\pi - \frac{3\sqrt{3}}{2}$
 ④ $\pi + \frac{\sqrt{3}}{2}$ ⑤ $\pi + \frac{3\sqrt{3}}{2}$

4. 극한 $\lim_{x \rightarrow 0} \frac{\int_0^{2x^2} \sin\left(\frac{t^2}{3}\right) dt}{x^6}$ 의 값은? [2점]

- ① 0 ② $\frac{2}{3}$ ③ $\frac{8}{9}$ ④ $\frac{8}{3}$ ⑤ ∞

5. 곡선 $x=3+2t^{3/2}$, $y=3t$ ($0 \leq t \leq 3$)의 호의 길이는? [2점]

- ① 14 ② 15 ③ 16 ④ 17 ⑤ 18

6. 직선 l 과 평면 P 의 방정식은 다음과 같다.

$$l : 4-x = \frac{y+1}{3} = \frac{z-2}{2}$$

$$P : 3x+y-2z=3$$

평면 Q 가 다음을 만족할 때 $a+b+c$ 의 값은? [2점]

- (가) 평면 Q 의 방정식은 $ax+by+cz=1$ 이다.
 (나) 평면 Q 는 직선 l 을 포함한다.
 (다) 평면 Q 는 평면 P 에 수직이다.

- ① $-\frac{1}{4}$ ② $-\frac{1}{2}$ ③ 0 ④ $\frac{1}{2}$ ⑤ $\frac{1}{4}$

7. 함수 $f(x, y) = e^{\sqrt{x}} \ln(y^2+1)$ 이고, $2x-y=s$,

$x+y=t$ 라 하자. $s=1$, $t=2$ 일 때 편도함수 $\frac{\partial f}{\partial t}$ 의 값은? [2점]

- ① $\frac{e}{6}(\ln 2-4)$ ② $\frac{e}{6}(\ln 2+4)$ ③ $\frac{e}{3}(\ln 2-2)$
 ④ $\frac{e}{3}(\ln 2+2)$ ⑤ $\frac{e}{3}(\ln 2+4)$

8. 함수 f 와 g 가 다음을 만족한다.

$$(가) f(x, y, z) = x + y^2 + z - 6$$

(나) $g(x, y, z)$ 는 미분가능한 함수이다.

$$(다) g(1, 2, 1) = 2$$

점 $(1, 2, 1)$ 에서 벡터 $\mathbf{u} = \left\langle 0, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}} \right\rangle$ 방향에 대한 함수 fg 의 방향도함수의 값은? [3점]

- ① $\frac{5}{2}\sqrt{2}$ ② 5 ③ $5\sqrt{2}$ ④ $10\sqrt{2}$ ⑤ 15

9. 원기둥 $x^2+y^2=1$ 과 두 평면 $z=\sqrt{3}y$, $z=0$ 으로 둘러싸인 입체의 겉넓이는? (단, $z \geq 0$) [2점]

- ① $\frac{\pi}{2} + 2\sqrt{3}$ ② $\pi + \sqrt{3}$ ③ $\pi + 2\sqrt{3}$
 ④ $\frac{3\pi}{2} + \sqrt{3}$ ⑤ $\frac{3\pi}{2} + 2\sqrt{3}$

10. 벡터장 $\mathbf{F}(x, y, z) = \langle 2xz, 4xy, -z^2 \rangle$ 이고 S 는 두 곡면 $y=\sqrt{x}$, $y=2\sqrt{x}$ 와 평면 $z=0$, $z=1-y$ 에 의하여 유계된 영역의 곡면일 때, 면적분

$$\iint_S \mathbf{F} \cdot d\mathbf{S}$$

- ① $\frac{1}{16}$ ② $\frac{1}{32}$ ③ 0 ④ $-\frac{1}{32}$ ⑤ $-\frac{1}{16}$

11. 다음 반복적분의 값을 구하시오. [2점]

$$\int_{\frac{1}{\sqrt{2}}}^1 \int_{\sqrt{1-x^2}}^x e^{x^2+y^2} dy dx + \int_1^{\sqrt{2}} \int_0^x e^{x^2+y^2} dy dx + \int_{\sqrt{2}}^2 \int_0^{\sqrt{4-x^2}} e^{x^2+y^2} dy dx$$

- ① $\frac{\pi}{8}(e^4 - e^2)$ ② $\frac{\pi}{8}(e^4 - e)$ ③ $\frac{\pi}{6}(e^4 - e^2)$
 ④ $\frac{\pi}{6}(e^4 - e)$ ⑤ $\frac{\pi}{4}(e^4 - e^2)$

12. 행렬 $A = \begin{pmatrix} 2 & 1 & 0 \\ -1 & 0 & 1 \\ 4 & 2 & 1 \end{pmatrix}$ 의 역행렬을 $A^{-1} = \begin{pmatrix} a & b & c \\ d & e & f \\ g & h & i \end{pmatrix}$

라 할 때, $b+d+f+h$ 의 값은? [2점]

- ① -2 ② -1 ③ 0 ④ 1 ⑤ 2

13. 행렬 $A = \begin{pmatrix} 1 & 3 & 1 \\ -4 & -13 & 2 \\ 0 & -1 & 5 \end{pmatrix}$ 에 대하여 $\det(\text{adj } A)$ 의

값은? (단, $\text{adj } A$ 는 행렬 A 의 수반행렬이다.) [2점]

- ① -2 ② -1 ③ 0 ④ 1 ⑤ 2

14. 초깃값 문제 $y \frac{dy}{dx} = x \sin x$, $y(0) = 2$ 의 해에 대하여

$\{y(\pi)\}^2$ 의 값은? [2점]

- ① π ② $\pi+2$ ③ 2π ④ $2\pi+2$ ⑤ $2\pi+4$

15. $\mathcal{L}$ 을 라플라스 변환이라 하고, $\mathcal{L}^{-1}$ 을 $\mathcal{L}$ 의

역변환이라 하자. 함수 $F(s) = \frac{s}{s^2+4} e^{-\pi s}$ 에 대해

$\mathcal{L}^{-1}\{F(s)\}$ 을 $f(t)$ 라 할 때, $f(2\pi)$ 의 값은? [2점]

- ① $-\pi$ ② -1 ③ 0 ④ 1 ⑤ π

16. 좌표평면 위의 점 $(0, 0)$, $(1, 1)$, $(1, 2)$, $(0, 3)$, $(-1, 3)$, $(-2, 2)$, $(-2, 1)$, $(-1, 0)$ 에 대하여, 점 $(0, 0)$ 부터 점 $(-1, 0)$ 까지 주어진 순서대로 선분으로 연결한 곡선을 C 라 하자. 벡터장

$$\mathbf{F}(x, y) = \langle e^x - y, x - e^{y^2} \rangle$$

의 선적분 $\int_C \mathbf{F} \cdot d\mathbf{r} = a + \frac{b}{e}$ 일 때, $10a+b$ 의 값은?

(단, a 와 b 는 정수이고 e 는 자연상수이다.) [3점]

17. 정적분 $\int_0^{\frac{\pi}{2}} t^2 \sin t dt = a\pi + b$ 일 때, $120(a^2 + b^2)$ 의 값은? (단, a 와 b 는 유리수이다.) [3점]

18. 극곡선 $r = -3\cos\theta$ 의 내부와 극곡선 $r = 1 - \cos\theta$ 의 외부에 놓인 영역의 넓이가 $a\pi + b$ 일 때, $11a^2 + b^2$ 의 값은? (단, a 와 b 는 유리수이다.) [4점]

19. 두 곡면 $\rho = 1 - \cos\phi$ 와 $\rho = \cos\phi$ ($0 \leq \phi \leq \frac{\pi}{2}$)로

둘러싸인 입체 E 에 대해,

$$\iiint_E \frac{480}{\pi} dV$$

의 값은? (단, 두 곡면은 구면좌표계로 표현되었다.) [4점]

20. $y_1(t)$, $y_2(t)$ 를 초깃값 문제

$$\begin{pmatrix} y_1' \\ y_2' \end{pmatrix} = \begin{pmatrix} 4 & 1 \\ 1 & 4 \end{pmatrix} \begin{pmatrix} y_1 \\ y_2 \end{pmatrix}, \quad y_1(0) = 3, \quad y_2(0) = 1$$

의 해라고 하자. $y_1(1)y_2(1) = ae^b + ce^d$ 일 때,

$a^2 + b^2 + c^2 + d^2$ 의 값은? (단, a, b, c, d 는 정수이고 e 는 자연상수이다.) [4점]

21. 다음 중 문법적으로 어색한 것을 고르시오. [2점]

Taylor Swift is one of ① the most influential singer and songwriter of her era. ② Born in 1989, she released her first album in 2006 and toured the United States with country music performances, then gradually ③ shifted to pop music. Swift has released 14 albums, and her net worth soared to \$1.1 billion ④ following 2023's wildly popular Eras Tour.

22. 아래 밑줄 친 단어와 문맥상 의미가 가장 가까운 단어를 고르시오. [2점]

The Avengers, which brought together the superheroes that Marvel had established across four years of blockbuster movies, already looked like it was going to be a huge worldwide hit. It was the culmination of a decade of work by Marvel's producers and executives, including Kevin Feige, the president of Marvel Studios. It was also a sign that Marvel had placed a winning bet when, emerging from bankruptcy, the company had mortgaged the rights to its own characters to secure a line of credit from a Wall Street bank. The studio had staked its entire future on that loan, which financed the first movies Marvel Studios made.

- ① gambled ② secured
- ③ predicted ④ ruined

[23-24] 빈 칸에 들어갈 말로 가장 적절한 것을 고르시오.

23. In 2024, patent expirations are _____. Medicines worth \$38 billion in sales, including many biotech drugs, will meet competition from cheaper generics. [3점]

- ① dissipating ② mounting
- ③ discrediting ④ encouraging

24. Unexpected economic trends _____ predictions in 2023. In a surprising turn of events, the expected

recession in 2023 never materialized, and inflation rates, which peaked in late 2022, continued to decline throughout 2023. Economies, contrary to predictions, remained generally robust. [2점]

- ① defied ② supported
- ③ appraised ④ contributed to

[25-26] 빈 칸에 들어갈 말로 가장 적절한 것을 순서대로 고르시오.

25. AI allows for easier and more comprehensive data aggregation, which in turn empowers nefarious actors to undertake (A) _____ cyberattacks, including spearphishing attacks targeting specific individuals or organizations. When this is combined with high-quality AI-generated content, even the most (B) _____ of Internet users may be vulnerable. [3점]

- ① ardent – relentless ② customized – ingenuous
- ③ tailored – vigilant ④ random – prudential

26. The ability to maintain, cope, and withstand is about (A) _____, whereas the ability to recover or bounce back is about (B) _____. So, for instance, taking an industry-level unit of analysis, during the COVID-19 pandemic, most organizations providing health care and education services withstood difficulties whereas those in the travel and tourism industries suffered and then recovered. An example at a business level of analysis is the taxi industry. Traditional taxi companies were resilient when their performance degraded at first with the lockdowns but then recovered as volume returned. Local disability-specialized taxi companies were robust and somewhat insensitive. These examples reflect that they are different concepts and demonstrate that the mechanisms driving these outcomes are different. [2 점]

- ① vulnerability – flexibility
- ② adaptability – anti-fragility
- ③ durability – tenacity
- ④ robustness – resilience

[27-28] 다음 글을 읽고 문제에 답하시오.

When violators are less likely to be punished through domestic judicial action, the power of the courts to bring governments into line with international law decreases. The law-and-economics literature often adopts a statistical terminology and refers to occasions on which a violator of law is not prosecuted as type II errors. A higher likelihood of type II error creates a lower incentive for actors to obey the law because there is a lower probability that they would face a penalty for not doing so.

[A] Therefore, courts face important information asymmetries with respect to enforcing international commitments on the other branches of government. Legislatures and executives often violate legal commitments and have an incentive to keep these violations hidden.

[B] Information is crucial to the reduction of type II errors. Enforcement mechanisms depend on effective monitoring mechanisms. Violators cannot be punished unless their transgressions are observed. While courts have strong enforcement powers, they have relatively weak monitoring powers.

[C] This is the reason why courts depend on other actors to bring information to them regarding alleged violations of international commitments. Overcoming information asymmetries through fire alarm mechanisms is therefore a crucial component of effective enforcement of international commitments by domestic courts.

27. 글의 흐름에 맞게 위 문단의 순서를 배열하시오. [3점]

- ① A-B-C ② B-A-C
③ C-B-A ④ C-A-B

28. 위 글에서 유추할 수 있는 내용으로 가장 거리가 먼 것을 고르시오. [3점]

- ① When it comes to the court rulings, lack of information may cause 'false negative' results.
② With sufficient information, courts can have substantial impact on a state's commitment to international treaties.
③ It is easy for courts to prove government violations of international commitments.
④ For effective implementation of international commitments, domestic courts need other actors to monitor governments.

[29-30] 다음 글을 읽고 문제에 답하시오.

117 job applications are submitted on LinkedIn every second. That equates to more than ten million job applications each day. Factor in other job search engines like Indeed, Glassdoor and ZipRecruiter, all of which make applying for a job as simple as a few clicks on your keyboard, and you can see how recruiters are being inundated with resumes.

[A] The concept behind the automated video interview, or AVI is quite simple. Chosen applicants are invited to engage with a hiring platform to record and submit video responses to written questions that appear on applicants' screens. AI algorithms analyze the video responses, looking for things like the applicant's facial expressions, use of key words and tone of voice. A transcript of the responses along with a report summarizing the candidate's performance are then provided to the recruiter who decides if the candidate (A) _____ to the next phase of the interview process.

[B] However, the process is also fraught. AI recruitment platforms have been criticized for building bias into their algorithms. And job candidates find AVIs confusing because the format is relatively new, stress-inducing because of the time constraints imposed on responses, and unsettling because of the lack of transparency around how they will ultimately be assessed.

[C] There are obvious advantages to this type of interview. Employers gain efficiencies by screening significantly more applicants using significantly fewer human resources. And, in theory, AVIs remove implicit bias making the interview process more objective. Applicants appreciate the flexibility of being able to choose when they conduct the interview and the convenience of being able to do so in a comfortable location of their choice.

[D] It's not surprising then that companies in search of the most qualified candidates are seeking more efficient ways to sift through this flood of applicants. And so, a new and rapidly growing trend has (B) _____, the use of AI in the recruitment process. A surprisingly large number of companies—*Harvard Business Review* estimates as many as 86% of all employers—are now limiting or eliminating human involvement in the initial stages of the interview process and replacing the interviewer with artificial intelligence.

29. 다음 (A)와 (B)에 들어갈 말을 순서대로 고르시오. [2 점]

- ① drops out – materialized ② advances – emerged
③ proceeds – changed ④ falls – shifted

30. 글의 흐름에 맞게 위 문단의 순서를 배열하십시오. [3점]

- ① A-B-C-D ② D-C-B-A
③ A-D-C-B ④ D-A-C-B

[31-32] 다음 글을 읽고 문제에 답하십시오.

Naturally, almost any mammal species that is sufficiently large is capable of killing a human. People have been killed by pigs, horses, camels, and cattle. Nevertheless, some large animals have much nastier dispositions and are more incurably dangerous than are others. Tendencies to kill humans have disqualified many otherwise seemingly ideal candidates for domestication.

One obvious example is the grizzly bear. Bear meat is an expensive delicacy, grizzlies weigh up to 1,700 pounds, they are mainly herbivores (though also formidable hunters), their vegetable diet is very broad, they thrive on human garbage (thereby creating big problems in Yellowstone and Glacier National Parks), and they grow relatively fast. If they would behave themselves in captivity, grizzlies would be a fabulous meat production animal. The Ainu people of Japan made the experiment by routinely rearing grizzly cubs as part of a ritual. For understandable reasons, though, the Ainu found it prudent to kill and eat the cubs at the age of one year. Keeping grizzly bears for longer would be suicidal; I am not aware of any adult that has been _____.

Another otherwise suitable candidate that disqualifies itself for equally obvious reasons is the African buffalo. It grows quickly up to a weight of a ton and lives in herds that have a well-developed dominance hierarchy, a trait whose virtues will be discussed below. But the African buffalo is considered the most dangerous and unpredictable large mammal of Africa. Anyone insane enough to try to domesticate it either died in the effort or was forced to kill the buffalo before it got too big and nasty. Similarly, hippos, as four-ton herbivores, would be great barnyard animals if they weren't so dangerous. They kill more people each year than do any other African mammals, including even lions.

31. 문맥상 빈 칸에 들어갈 단어로 가장 적절한 것을 고르시오. [2점]

- ① tamed ② sane
③ captured ④ crazy

32. 위 글의 제목으로 가장 적절한 것을 고르시오. [3점]

- ① How to Raise Violent Animals
② Animals That Are Difficult to Domesticate
③ The Brutality of Grizzly Bears and African Buffalos
④ Animals That Kill People

Stress occurs when you face a new, unpredictable or threatening situation, and you don't know whether you can manage it successfully. When you're physically or emotionally stressed, your body snaps into fight-or-flight mode. Cortisol rushes through your system, signaling your body to release glucose. Glucose, in turn, provides energy to your muscles so that you are better prepared to fight off a threat or run away. During this cortisol rush, your heart rate may rise, your breathing may become rapid, and you may feel dizzy or nauseated.

If you truly needed to fight or flee a predator, your cortisol levels would drop back down once the conflict was over. When you're chronically stressed, however, those levels stay elevated. Remaining in that heightened state is no good since high levels of cortisol can exacerbate health conditions such as cardiovascular disease, diabetes and chronic gastrointestinal problems. Stress can also cause or contribute to anxiety, irritability, poor sleep, substance abuse, chronic distrust or worry, and more.

_____, there are many ways to combat stress. Keep a daily routine, get plenty of sleep, eat healthy foods, and limit your time following the news or engaging in social media, recommends the World Health Organization. It also helps to stay connected with others and to employ calming practices such as meditation and deep breathing. One of the most successful tools, though, is physical activity.

35. 빈 칸에 들어갈 적절한 말을 고르시오. [2 점]

- ① Unfortunately ② In contrast
- ③ Luckily ④ In sum

36. 위 글에서 유추할 수 있는 내용으로 가장 거리가 먼 것을 고르시오. [2 점]

- ① Short-term stress can produce constructive changes.
- ② If stress is continuous, the level of cortisol would stay heightened.
- ③ Engaging in social media is recommended to combat stress.
- ④ With an elevated level of cortisol, an individual's breathing may become rapid.

[37-38] 다음 글을 읽고 문제에 답하십시오.

The defining question about global order in the decades ahead will be: can China and the US escape Thucydides's trap? The historian's metaphor reminds us of the dangers two parties face when a rising power rivals a ruling power—as Athens did in 5th century BC and Germany did at the end of the 19th century. Most such challenges have ended in war. Peaceful cases required huge adjustments in the attitudes and actions of the governments and the societies of both countries involved.

The rapid emergence of any new power disturbs the (A) _____. In the 21st century, as Harvard University's Commission on American National Interests has observed about China, "a diva of such proportions cannot enter the stage without effect".

If we were betting on the basis of history, the answer to the question about Thucydides's trap appears (B) _____. In 11 of 15 cases since 1500 where a rising power emerged to challenge a ruling power, war occurred. Think about Germany after unification as it overtook Britain as Europe's largest economy. In 1914 and in 1939, its aggression and the UK's response produced world wars.

Uncomfortable as China's rise is for the US, there is nothing unnatural about an increasingly powerful China demanding more say and greater sway in relations among nations. Americans, particularly those who lecture Chinese about being "more like us", should reflect on our own history.

37. 밑줄 친 부분에 들어갈 말을 순서대로 고르시오. [2점]

- ① disequilibrium – apparent
- ② disequilibrium – obscure
- ③ status quo – ambivalent
- ④ status quo – obvious

수고하셨습니다.