

# 國立中正大學九十八學年度學士班二年級轉學生招生考試試題

數學系、地球與環境科學系、物理學系、

學系別：化學暨生物化學系、資訊工程學系、經濟學系、 科目：微積分

電機工程學系、機械工程學系、通訊工程學系

第 1 節

第 1 頁，共 1 頁

★ Write down your answers without calculations in problems 1 ~ 5.

1. Evaluate the following limits:

(a).  $\lim_{x \rightarrow 1} \frac{(1 - \sqrt{x})(1 - \sqrt[3]{x})(1 - \sqrt[4]{x})}{(1 - x)^3} = \underline{\hspace{2cm}}$ . (5 pts.)

(b).  $\lim_{x \rightarrow 0} (e^{3x} + 2x)^{\frac{1}{x}} = \underline{\hspace{2cm}}$ . (5 pts.)

(c).  $\lim_{n \rightarrow \infty} \left( \frac{1}{\sqrt{n^2 + 1}} + \frac{1}{\sqrt{n^2 + 2}} + \cdots + \frac{1}{\sqrt{n^2 + n}} \right) = \underline{\hspace{2cm}}$ . (5 pts.)

(d).  $\lim_{n \rightarrow \infty} \frac{1}{n^{p+1}} (1^p + 2^p + \cdots + n^p) = \underline{\hspace{2cm}}$  where  $p > 0$ . (5 pts.)

2. Suppose that  $f(x) = \begin{cases} ax - b & \text{if } x \leq 1 \\ x^3 & \text{if } x > 1 \end{cases}$  is a differentiable function on  $\mathbb{R}$ . Then

$\lim_{x \rightarrow 0^+} \frac{1}{x\sqrt{x}} \left( a \tan^{-1} \left( \frac{\sqrt{x}}{\sqrt{a}} \right) - b \tan^{-1} \left( \frac{\sqrt{x}}{\sqrt{b}} \right) \right) = \underline{\hspace{2cm}}$ . (15 pts.)

3. Let  $a_n = \int_0^{\frac{\pi}{2}} (\sin x)^n dx$  where  $n \in \mathbb{N} \cup \{0\}$ . Then

(a).  $\frac{a_n}{a_{n-2}} = \underline{\hspace{2cm}}$  where  $n \in \mathbb{N}$  and  $n \geq 2$ . (10 pts.)

(b).  $a_n = \underline{\hspace{2cm}}$  if  $n$  is even. (5 pts.)

(c).  $a_n = \underline{\hspace{2cm}}$  if  $n$  is odd. (5 pts.)

4. Assume that  $f(x) = \sqrt{x^3}$ . Define  $\Gamma = \{(x, f(x)) \in \mathbb{R}^2 | 0 \leq x \leq 4\}$  and

$R = \{(x, y) \in \mathbb{R}^2 | 0 \leq x \leq 4, 0 \leq y \leq f(x)\}$ . Then

(a). The arc length of  $\Gamma = \underline{\hspace{2cm}}$ . (5 pts.)

(b). The volume of the solid obtained by rotating  $R$  about the  $x$ -axis is  $\underline{\hspace{2cm}}$ . (5 pts.)

5. Suppose that  $\int \int_S \left( \sqrt{\left(\frac{y}{x}\right)^3} + \sqrt{xy} \right) dx dy = \int \int_T (v^3 + u) \frac{\partial(x, y)}{\partial(u, v)} du dv = A$ ,

where  $S = \{(x, y) \in \mathbb{R}^2 | 1 \leq xy \leq 9, 1 \leq y/x \leq 4\}$ . Then

(a).  $T = \underline{\hspace{2cm}}$ . (5 pts.)

(b).  $A = \underline{\hspace{2cm}}$ . (5 pts.)

6. Show that if  $a_0, a_1, \dots, a_n$  are real numbers satisfying

$$\frac{a_0}{1} + \frac{a_1}{2} + \cdots + \frac{a_n}{n+1} = 0,$$

then the equation  $a_0 + a_1x + a_2x^2 + \cdots + a_nx^n = 0$  has at least one real root. (10 pts.)

7. Find extrema of  $f(x, y, z) = x^3 + y^3 + z^3$  subject to  $x^2 + 2y^2 + 3z^2 = 4$ . (15 pts.)

(10%) 4. What is the effect of the following program segment?

```
for (i = 0; i < MAX - 1; ++i)
    if (a[i] > a[i + 1]) {
        temp = a[i];
        a[i] = a[i + 1];
        a[i + 1] = temp;
    }
```

- (a) Reverses the numbers stored in the array.
- (b) Counts the number of elements of a greater than its first element.
- (c) Arranges the elements of array a in ascending order.
- (d) Puts the largest value in the last array position.
- (e) None of the above.

(10%) 5. What is the effect of the following program segment?

```
temp = 0;
for (i = 1; i < MAX; ++i)
    if (a[i] > a[0])
        ++temp;
```

- (a) Counts the number of elements of array a greater than its initial element.
- (b) Arranges the elements of array a in ascending order.
- (c) Puts the largest value in the last array position.
- (d) Reverses the numbers stored in the array.
- (e) None of the above.

(20%) 1. Convert the following decimal numbers to binary.

- (a) 37      (b) 144      (c) 1023      (d) 99

(50%) 2. Define the following terms.

- (a) Top-down design
- (b) High-level language
- (c) Moore's law
- (d) Solid-state drive
- (e) Local area network

For Questions 3 - 5 assume the following statements.

```
#define MAX 100  
int a[MAX], i, j, temp;
```

(10%) 3. What is the effect of this program segment?

```
for (i = 0; i < MAX / 2; ++i) {  
    temp = a[i];  
    a[i] = a[MAX - i - 1];  
    a[MAX - i - 1] = temp;  
}
```

- (a) Puts the largest value in the last array position.
- (b) Arranges the elements of array a in ascending order.
- (c) Counts the number of elements of a greater than its first element.
- (d) Reverses the numbers stored in the array.
- (e) None of the above.

**I. Each of the sentences below includes an English error. Choose the underlined portion that has the mistake (10%--2 points for each correct answer).**

Example:

I are tired, but I will study anyway.

- (A) are
- (B) but
- (C) will
- (D) anyway

In this case, we should choose (A) since *I are tired* is incorrect; the sentence should read *I am tired, but I will study anyway*.

1. Popular belief in the United States is that an early life of hardship and poverty made Abraham Lincoln to be the great leader he was.
  - a. an early
  - b. made
  - c. to be
  - d. he was
  
2. The architecture exhibited in the Empire State Building conveys an idea of the prevailing attitudes is important for the historical and cultural value the building represents.
  - a. conveyed
  - b. prevailing
  - c. is
  - d. represents
  
3. In 2001 George W. Bush, Jr., entered his first year office as President of the United States.
  - a. In 2001
  - b. entered
  - c. office
  - d. as President
  
4. Similar in climate and geography as northeastern cities is Portland, the largest city in Oregon.
  - a. in
  - b. as
  - c. is
  - d. largest
  
5. Because of extensive research in the field of genetic engineers, scientists can now create plants that farmers can grow in harsh climates.
  - a. research
  - b. engineers
  - c. farmers
  - d. harsh

**II. Choose the answer choice that best completes the sentence (10%--2 points for each correct answer)**

Example:

I \_\_\_\_\_ tired, but I will study anyway.

- (A) is
- (B) being
- (C) am
- (D) to be

In this case, we should choose (C) since the sentence should read *I am tired, but I will study anyway.*

1. According to the scientific method, a scientist must consider \_\_\_\_\_ outcome.
  - a. any outcome and to be a possible
  - b. any outcome and the possible
  - c. any outcome a possibility
  - d. any outcome a possible
  
2. After her death in 1986 many documentaries \_\_\_\_\_ Georgia O'Keeffe were produced.
  - a. related the life and work of
  - b. to relate life and work
  - c. life and working to relate
  - d. relating the life and work of
  
3. \_\_\_\_\_ the passage of light, many new plastics are processed using technologies rivaling those used in the manufacture of computer chips.
  - a. To better permit
  - b. Permitting better
  - c. For the better of
  - d. It is better for
  
4. Uranium, \_\_\_\_\_, is an exceedingly rare and potentially dangerous element.
  - a. to found in trace quantities
  - b. found in trace quantities
  - c. finding in trace quantities
  - d. to be found in trace quantities
  
5. The Flower Market in San Francisco is \_\_\_\_\_, and was established in the 1930's.
  - a. home to the country's second largest flower market
  - b. home of the second largest flower market in the country
  - c. the second flower market in the country's home of
  - d. the home to the second country's large flower market

**III. Choose the best answer for each sentence below (10%--1 point for each correct answer).**

1. Many students have come to rely \_\_\_\_\_ the Internet for information.
  - a. at
  - b. in
  - c. on
  - d. by
2. Any experienced captain will learn to depend \_\_\_\_\_ her crew to keep her ship in order.
  - a. of
  - b. at
  - c. on
  - d. with
3. Because the Amazon rain forest is teeming \_\_\_\_\_ life, it is considered to be one of the most important ecological environments in the world.
  - a. with
  - b. of
  - c. for
  - d. on
4. One criticism of some well-established corporations that continues even today is that they profited \_\_\_\_\_ violations of human rights in the past.
  - a. against
  - b. in
  - c. from
  - d. to
5. Fortunately, an appeal \_\_\_\_\_ limited use of air conditioning during the heat wave was accepted, and no power shortages were reported.
  - a. of
  - b. for
  - c. by
  - d. around
6. To qualify \_\_\_\_\_ the position of President of the United States of America, one must be at least 35 years old.
  - a. of
  - b. in
  - c. from
  - d. for
7. Believers in pacifism believe that there is never a good reason to resort \_\_\_\_\_ violence.
  - a. to
  - b. from
  - c. in
  - d. on

8. The air we breathe consists \_\_\_\_\_ nitrogen, oxygen, carbon dioxide, and trace amounts of several other gases.
- from
  - for
  - of
  - by
9. It is difficult to decide \_\_\_\_\_ a university to apply to because you cannot really know the quality until you attend.
- to
  - on
  - in
  - for
10. If a person does not get enough calcium in their diet, she risks suffering \_\_\_\_\_ debilitating bone disorders when she gets older.
- of
  - to
  - under
  - from

**IV. Choose the correct definition (20%--2 points for each correct answer).**

1. "I'm beat!" means that I feel very \_\_\_\_\_.
- angry
  - tired
  - nervous
2. "I'll be in touch" means that I'll \_\_\_\_\_ later.
- contact you
  - meet you
  - visit you
3. "Uh-huh" is a very informal way of saying \_\_\_\_\_.
- I don't know
  - maybe
  - yes
4. If someone answers a question by saying, "Beats me," he/she means that \_\_\_\_\_.
- he/she thinks the question is stupid
  - he/she doesn't understand you
  - he/she doesn't know the answer
5. People say, "Chin up!" when they want to \_\_\_\_\_ someone.
- criticize
  - warn
  - encourage
6. When someone says, "I see where you're coming from," his/her meaning is \_\_\_\_\_.
- "I know where you live."
  - "I understand your thinking/reasons."
  - "I can guess your nationality."

7. If you give your opinion on something and hear the response "Well, to each his own," the person you are speaking to \_\_\_\_\_.
- doesn't agree, but is too polite to say so
  - thinks your idea is creative and original
  - wants you to explain in more detail
8. "Don't look a gift horse in the mouth" means that you \_\_\_\_\_ something that's given to you.
- shouldn't appear too eager to accept
  - should be very suspicious of
  - shouldn't be too critical of
9. If someone "has a short fuse," he or she \_\_\_\_\_.
- is easy to upset and make angry
  - can't concentrate for a very long period of time
  - never has a strong opinion about anything
10. If someone says he/she has had "one of those days," he/she means that the day has been \_\_\_\_\_.
- so normal that it was boring
  - busy, unpredictable, and frustrating
  - full of unexpected (but pleasant) surprises

**V. Reading Comprehension (20%--4 points for each correct answer)**

**Read the following story and then answer the questions about it below.**

Three years ago on the last day of January, I had a big problem. I'll never forget that day. The story began when my uncle, my cousin, and I went into the desert. My uncle was the oldest at 72 years, but he was still strong. My cousin was 10 years old, and I was 25. All of us liked hunting. Usually we went on the weekend, especially in winter, because that was the hunting season.

On the 25th of January, we readied everything in the car, a Range Rover with four-wheel drive. We started out in the afternoon and drove for three hours. We reached the place we were looking for at 5:15. First, we set up the tent, then we made coffee and had a few minutes of rest. After that, we left to go hunting, using a falcon to help us find and capture birds and rabbits. We spent two hours without finding anything, so we decided to go back to camp. On our way back, my cousin saw a rabbit and cried, "Rabbit!! Rabbit! Quick!" I quickly took the falcon's head cover off and flung it away. When the rabbit saw the falcon, it took off fast, but my falcon was a professional hunter. He flew up and then dropped back down to trick the rabbit, catching him in less than two minutes. We took it and went back to the camp where we started to cook our dinner. We ate some delicious food, drank Arabic coffee, and sat around the fire talking until 10:30 P.M. Then we went to bed.

We left camp the next morning at 7 o'clock, heading north where we found and caught two kinds of birds. However, we ran into trouble at about 10:00 A.M. because the car got stuck in the sand! We spent about three hours trying to pull it out with no success. Finally, we decided to walk. I talked with my uncle about how hard it would be for an old man and young boy to walk more than 40 km. in the desert. He agreed, so I took a bottle of water and began to walk south alone. I knew the way well, but it was a long way to go in the sand. I walked more than four hours without stopping though I felt increasingly tired and thirsty. I drank all the water from the bottle then finally stopped to rest, sleeping for about two hours.

When I got up, darkness had covered the area. "What should I do?" I asked myself then decided I should keep moving south. I was worried about my uncle and cousin and learned later that they were also worried about me. Suddenly, I met a Bedouin man riding a camel who invited me to his house. After resting for awhile I asked him to take me to the road, which he did. Once there, I was able to catch a ride to the city to get help. It took another day to get back to my uncle and cousin and bring them to safety.

I learned a lesson from this story, which was that the desert can be very dangerous. Next time, when we go hunting, we'll go in a larger group with two or more cars. That way, we can keep each other safe. Although we know the desert is dangerous, we won't give up hunting there.



**Circle the correct answer.**

1. Which of the following is NOT true?
  - a. Saeed's uncle was over 70 years old.
  - b. Saeed was younger than his uncle and his cousin.
  - c. Three males went hunting.
  - d. Winter is the hunting season, so they went hunting in January.
  - e. Saeed's uncle was an old, but strong man.
  
2. Choose the correct answer.
  - a. The Range Rover had front-wheel drive.
  - b. The group left for the hunting trip at 2:15 P.M.
  - c. After resting, they set up their tent.
  - d. During the first two hours, the group found several animals to hunt.
  - e. The rabbit tricked the falcon.
  
3. Which is NOT a reason that Saeed had to walk forty km.?
  - a. The car got stuck in the sand.
  - b. It was hard for an old man or a very young boy to walk 40 km.
  - c. Saeed did not know the way and he became lost.
  - d. The group spent 3 hours trying to pull the car out of the sand but failed.
  - e. There was nobody around to help the hunters get out of the sand.
  
4. Which is NOT true about the Bedouin man?
  - a. He was riding a camel.
  - b. He took Saeed to get help.
  - c. He took Saeed to his house.
  - d. He allowed Saeed to rest.
  - e. He took Saeed to the road.
  
5. What lesson did Saeed learn from his experience?
  - a. Hunting is dangerous and he will not hunt again.
  - b. When hunting, Saeed will use a different type of car.
  - c. When hunting in the desert, people should go in groups with two or more cars.
  - d. Bedouins are not helpful to strangers in the desert.

**VI. Essay (30%)**

**Write an essay of 200-300 words explaining why you like studying English. Include specific examples and explanations.**

一、請填充空格裏的經典名言、絕妙詩詞（每題 5 分，共 50%）

- (1)《大學》曰：「大學之道，在明明德，在親民，在（            ）。」
- (2)《易·象傳》曰：「天行健，君子以（            ）。」
- (3)《論語》曾子曰：「慎終追遠，（            ）矣。」
- (4)《孟子》曰：「大人者，不失其（            ）者也。」
- (5)張載〈西銘〉曰：「天地之帥，吾其性。民吾同胞，（            ）。」
- (6)《詩經》：「關關雎鳩，在河之洲，（            ），君子好逑。」
- (7)王維詩：「獨坐幽篁裏，彈琴復長嘯，深林人不知，（            ）。」
- (8)陳子昂詩：「前不見古人，後不見來者，念（            ），獨愴然而淚下。」
- (9)陶淵明詩：「結廬在人境，而無車馬喧。問君何能爾？（            ）。」
- (10)蘇軾詞：「明月幾時有，（            ）。不知天上宮闕，今夕是何年。」

二、請寫出底下的經典名著、文學作品的作者（每題 5 分，共 30%）

- (11)《靈山》
- (12)《阿 Q 正傳》
- (13)《白話文學史》
- (14)《邊城》
- (15)《國史大綱》
- (16)《台灣通史》

三、文學賞析題：請描述下文所呈現的「聽覺美感」和「心靈覺受」20%

張心齋《幽夢影》：「春聽鳥聲，夏聽蟬聲，秋聽蟲聲，冬聽雪聲，白晝聽棋聲，月下聽簫聲，山中聽松聲，水際聽款乃聲，方不虛生此耳。」