

國立中正大學102學年度學士班二年級轉學生招生考試試題

學系別：數學系、地球與環境科學系、資訊工程學系、電機工程學系
機械工程學系、化學工程學系、通訊工程學系

科目：微積分

第 1 節

第 1 頁，共 3 頁

一、複選題(每題7分, 共28分. 請注意:每題至少有一個或者一個以上之正確答案, 答案完全正確得7分, 否則得0分).

1. Which of the following must be true?

(A) $\lim_{x \rightarrow 0^+} \left(\frac{1}{x} - \frac{1}{x^2} \right) = 0$ (B) $\lim_{x \rightarrow 0^-} \left(\frac{1}{x} + \frac{1}{x^2} \right) = \infty$

(C) $\lim_{x \rightarrow 0^+} \frac{\sin 4x}{\tan 5x} = \frac{4}{5}$ (D) $\lim_{x \rightarrow 0^+} \frac{\sqrt[4]{16+x} - 2}{x} = \frac{1}{16}$

2. Which of the following must be true?

(A) $\int_e^{e^2} \frac{(\ln x)^4}{x} dx = \frac{31}{5}$ (B) $\int_0^4 [e^{-x} + 1] dx = 3 - e^{-4}$

(C) $\int_0^1 \frac{dx}{x^2}$ diverges (D) $\int_0^\pi \frac{\sin^2 x}{\sqrt{x}} dx$ converges

3. Which of the following must be true?

(A) the series $\sum_{k=1}^{\infty} \frac{(-1)^{k-1}}{k^p}$ converges for all $p \neq 0$

(B) the series $\sum_{k=1}^{\infty} (-1)^{k-1} k^2 e^{-k}$ converges absolutely

(C) the series $\sum_{k=1}^{\infty} \frac{\cos(2k)}{k^2}$ converges (D) the series $\sum_{k=1}^{\infty} \left(1 + \frac{1}{k}\right)^{-k}$ diverges

4. Set $f(x, y) = x^2 + 2y^2$. Which of the following must be true?

(A) $f(x, y)$ is concave upward on the line $y = -x$

(B) the relative minimum of $f(x, y)$ subject to the constraint $x + y = 1$ is $\frac{2}{3}$

(C) the absolute minimum of $f(x, y)$ on its domain does not exist

(D) the minimum rate of change of $f(x, y)$ at the point $P(1, -1)$ is $-4\sqrt{5}$

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二、填空题(每個空格7分, 共42分)

1. Find the arc length of the curve $x = \frac{y^2}{2}$ from $y = 0$ to $y = 1$. (a)

2. At what point does the curve $y = \ln x$ have maximum curvature? (b)

3. Find the volume of the solid obtained by rotating about the x -axis the region under the curve $y = \sin x \cos x$ on the interval $[0, \pi/2]$. (c)

4. Find the area of the surface cut from the paraboloid $x - y^2 - z^2 = 0$ by the the planes $x = 2$ and $x = 6$. (d)

5. If f is a continuous function such that

$$\int_0^x f(t)dt = xe^{-x} - \int_0^x t^2 f(t)dt$$

for all x , find an explicit formula for $f(x)$. (e)

6. Find the interval of convergence of the series $\sum_{n=1}^{\infty} \frac{(x+1)^n}{n \cdot 3^n}$. (f)

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三、計算題(30分，這部分必須有詳細演算過程，僅有答案而沒有演算過程得0分)

1. (10分) (a) (5分) Derive the formula

$$\int_0^{\pi/2} \sin^n x dx = \frac{n-1}{n} \int_0^{\pi/2} \sin^{n-2} x dx.$$

(b) (5分) Use the above formula to evaluate $\int_0^{\pi/2} \sin^{2n} x dx$.

2. (10分) Use the surface integral in Stokes' Theorem to calculate the flux of the field

$$\mathbf{F} = (x - y)\mathbf{i} + (y - z)\mathbf{j} + (z - x)\mathbf{k}$$

across the surface

$$S: \mathbf{r}(\phi, \theta) = (2 \sin \phi \cos \theta)\mathbf{i} + (2 \sin \phi \sin \theta)\mathbf{j} + 2 \cos \phi \mathbf{k}, \quad 0 \leq \phi \leq \pi/2, \quad 0 \leq \theta \leq 2\pi$$

in the direction of the outward unit normal \mathbf{n} .

3. (10分) Suppose that f and g are scalar functions with continuous first- and second-order partial derivatives throughout a region E that is bounded by a closed piecewise smooth surface S . Show that

$$\iint_S f \nabla g \cdot \mathbf{n} dS = \iiint_E (f \nabla^2 g + \nabla f \cdot \nabla g) dV$$

and that

$$\iint_S (f \nabla g - g \nabla f) \cdot \mathbf{n} dS = \iiint_E (f \nabla^2 g - g \nabla^2 f) dV$$

1. (20%) True or false
 - (a) This assignment statement stores the sum of b and c in a: $b + c = a$;
 - (b) Functions can be called several times from different points in a program because for each call the program keeps track of the statement to which control returns after the call finishes its last step.
 - (c) A syntax error in a program is an error that causes the program to produce incorrect output.
 - (d) When a program begins to execute, the contents of the memory cells it uses are initially empty.
 - (e) The loop repetition condition of a while or for statement can be false before the loop begins to execute.

2. (30%) Problems with short answer
 - (a) What does it mean to say that a processor is 3.2 GHz?
 - (b) Name the components of a von Neumann machine.
 - (c) What is operation system?
 - (d) Describe a parallel architecture that uses pipeline processing.
 - (e) Briefly describe the representative device of computing hardware in every generation.

3. (10%) Define a function named ABS_Diff that returns as its value the absolute difference between its two type double input parameters.

4. (10%) With the rapid growth of Multimedia transmission over Internet, PC development is facing a crisis. Image that you already have a smart phone, iPad or other brand of tablet devices, as well as Internet TV. Will you need PC anymore? Specify your opinion about the future of PC development.

5. (30%) Design and write a program in C which arranges three numbers A, B and C in ascending order. Besides, provide the flowchart of this program.

作答說明

1. 本測驗共 2 大部份，共 50 題，每題 2 分。
2. 請將答案填寫在答案卷上，未依規定填寫在答案卷上，一律不計分。
3. 測驗完成後，答案卷需連同題目卷一併繳交。

Part 1: Cloze (50%, 每題 2 分)

作答說明：選擇最適當的一個字詞填入空格。每題僅有一個選項最適合。

Pollution levels soared for a third day in a row in Singapore, as smoky haze from fires in Indonesia covered the city state. The Pollutant Standards Index hit 401 at 12:00 on Friday- the highest in Singapore's history. Indonesia has said it is unfair to blame it solely (1)___ the forest fires. Schools in parts of Malaysia and Indonesia have closed (2)___ . Singapore officials warned that the haze could (3)___ in place for weeks. "We can't tell how this problem is going to develop because it depends on the burning, it depends on the weather, it depends on the wind. It can easily last (4)___ several weeks and quite possibly it could last longer (5)___ the dry season ends in Sumatra which may be September or October."

- | | | | |
|--------------------|-------------|-----------------|------------------|
| 1. (A) over | (B) for | (C) with | (D) up |
| 2. (A) immediately | (B) briefly | (C) temporarily | (D) unexpectedly |
| 3. (A) remain | (B) wait | (C) retain | (D) carry |
| 4. (A) up | (B) on | (C) with | (D) for |
| 5. (A) since | (B) as | (C) until | (D) so |

There are now over 700 million motor vehicles in the world - and the number is (6)___ by more than 40 million each year. The (7)___ distance driven by car users is growing too - from 8km a day per person in western Europe in 1965 to 25 km a day in 1995. This dependence (8)___ motor vehicles has given rise to major problems, including environmental pollution, depletion of oil resources, traffic congestion and safety. While emissions from new cars are far less harmful than they used to be, city streets and motorways are becoming more crowded than ever, often with older trucks, buses and taxis which emit (9)___ levels of smoke and fumes. This concentration of (10)___ makes air quality in urban areas unpleasant and sometimes dangerous to breathe.

- | | | | |
|---------------------|-----------------|------------------|--------------|
| 6. (A) arisen | (B) rising | (C) raising | (D) raised |
| 7. (A) ordinary | (B) common | (C) universal | (D) average |
| 8. (A) with | (B) in | (C) on | (D) for |
| 9. (A) excessive | (B) unnecessary | (C) overdue | (D) moderate |
| 10. (A) transitions | (B) transfers | (C) transactions | (D) vehicles |

In addition to being responsible for more than 85 per cent of lung cancers, smoking is associated (11)___ cancers of the mouth, stomach and kidneys, and is thought to (12)___ about 14 per cent of leukemia and cancers. In 1990, smoking caused more than 84,000 deaths, mainly resulting (13)___ such problems as pneumonia, bronchitis and influenza. (14)___ is believed that smoking is responsible for 30 per cent of all deaths from cancer and clearly represents the most important preventable cause of cancer in countries (15)___ the United States today.

- | | | | |
|-----------------|-----------|-----------|----------|
| 11. (A) over | (B) by | (C) on | (D) with |
| 12. (A) situate | (B) shift | (C) cause | (D) root |
| 13. (A) of | (B) from | (C) in | (D) as |
| 14. (A) Which | (B) What | (C) It | (D) That |
| 15. (A) like | (B) over | (C) for | (D) to |

The only long-term solution to air pollution in cities is to design cities and neighborhoods so that car journeys are not necessary - all essential services being (16)___ within walking distance or easily (17)___ by public transport. Not only would this save energy and cut carbon dioxide emissions, it would (18)___ enhance the quality of community life, putting the emphasis (19)___ people instead of cars. Good local government is already bringing this (20)___ in some places.

- | | | | |
|--------------------|--------------|-------------|---------------|
| 16. (A) initiated | (B) created | (C) located | (D) invented |
| 17. (A) accessible | (B) occupied | (C) engaged | (D) connected |
| 18. (A) so | (B) also | (C) while | (D) as |
| 19. (A) by | (B) upon | (C) on | (D) for |
| 20. (A) down | (B) about | (C) up | (D) for |

A 1993 study by the European Federation for Transport and Environment found that car transport is seven times as (21)___ as rail travel in terms of the external social (22)___ - congestion, accidents, pollution, loss of cropland and natural (23)___, depletion of oil resources, and so on. Yet cars easily surpass trains or buses (24)___ a flexible and convenient mode of personal transport. It is unrealistic to expect people to give up private cars (25)___ mass transit.

21. (A) harmless (B) costly (C) precious (D) fortunate
 22. (A) sides (B) features (C) costs (D) factors
 23. (A) habits (B) environments (C) habitats (D) surroundings
 24. (A) as (B) against (C) by (D) with
 25. (A) in favor of (B) in honor of (C) in place of (D) in regard of

Part 2: Vocabulary: Choose the best definition for the underlined word(s) in each sentence (50%, 每題 2 分)

作答說明：每一個句子皆有一個劃底線字詞，選擇最適合該字詞意義的其中一個選項。

26. From infancy to old age, the effects of inadequate sleep can profoundly affect memory, learning, creativity, productivity and emotional stability, as well as your physical health.
 (A) plenty (B) satisfactory (C) offensive (D) not enough
27. The worldwide coal industry allocates extensive resources to researching and developing new technologies and ways of capturing greenhouse gases.
 (A) furnishes (B) assigns (C) provides (D) establishes
28. Google Street View, which launched in 2007, has been one of the search company's most ambitious projects to date. Using specially-adapted cars, it created panoramic images of more than five million miles of the world's roads.
 (A) discharged (B) released (C) initiated (D) inspected
29. By implementing pollution control measures, monitoring the effects of mining, the coal industry minimizes the impact on the neighboring community.
 (A) supervising (B) directing (C) organizing (D) observing
30. Hollywood has had a great deal of money to buy up artists and technical innovations from Europe to ensure its continued dominance over present or future competition.
 (A) impact (B) pressure (C) power (D) load
31. Hollywood films appealed because their special effects were more impressive.
 (A) created (B) requested (C) attended to (D) became popular
32. In recent years, Vancouver has become so designed to cause as little harm as possible to the environment that some stores don't even offer plastic bags.
 (A) conservative (B) natural (C) eco-friendly (D) conventional
33. Nationwide, sibling violence is the most common form of family violence, occurring four to five times as frequently as spousal or parental child abuse.
 (A) normally (B) commonly (C) ordinarily (D) regularly
34. More farmers will have the money and the incentive to manage their land in ways that are sustainable in the long run.
 (A) reason (B) desire (C) expectation (D) wish
35. Fuels produced from crop residues produce far less carbon dioxide than coal or oil, and absorb carbon dioxide as they grow.
 (A) draw on (B) exclude from (C) engage in (D) take in
36. In several countries they have become interested in the possibility of using fuel either as a replacement for petrol or as fuel for power stations.
 (A) principle (B) substitute (C) difference (D) convention
37. Soil erosion threatens the productivity of land in both rich and poor countries.
 (A) admission (B) submission (C) output (D) efficiency
38. Land clearing for agriculture is the largest single cause of deforestation.
 (A) treatment (B) hazard (C) getting rid of (D) removing the
 diseases trees
39. Chemical fertilizers and pesticides may contaminate water supplies.
 (A) correspond (B) communicate (C) pollute (D) transmit

40. It was not until the eighteenth century that Europe became seriously interested in the possibilities of using the rocket itself as a weapon of war.
(A) cruelly (B) slightly (C) truly (D) vaguely
41. In most developing countries, old cars without low fuel efficiency continue to predominate.
(A) thrive (B) overcome (C) happen as expected (D) be in the majority
42. Nicotine is only a small component of cigarette smoke, which contains more than 4,700 chemical compounds, including 43 cancer-causing substances.
(A) part (B) section (C) factor (D) feature
43. Scientific research has been providing evidence that years of cigarette smoking vastly increases the risk of developing fatal medical conditions.
(A) mental (B) deadly (C) costly (D) physical
44. 17 per cent of cases of lung cancer can be attributed to high levels of exposure to second-hand tobacco smoke during childhood and adolescence.
(A) experience (B) spotlight (C) contact (D) practice
45. The risk of lung cancer increases over the years of exposure if the spouse has been smoking four packs a day for 20 years.
(A) option (B) shelter (C) likelihood (D) threat
46. Technical solutions can reduce the pollution problem and increase the fuelled efficiency of engines.
(A) enhance (B) decrease (C) relieve (D) improve
47. With iPad introduced in schools, our kids are going to love learning on the cutting edge of innovation.
(A) vision (B) advance (C) inspiration (D) imagination
48. Global car use is increasing at a faster rate than the improvement in emissions and fuel efficiency which technology is now making possible.
(A) realistic (B) available (C) inexpensive (D) practical
49. Until a hundred years ago, most journeys were in the 20km range, the distance conveniently accessible by horse.
(A) reachable (B) practical (C) handy (D) open
50. Effects of sibling abuse often continue into adulthood. It can erode their sense of identity and their self-esteem.
(A) wear away (B) show off (C) put on (D) live up

一、選擇題：(每題5分，40%)

1. 下列哪個成語用字完全正確？(a) 莫終一是，(b) 前呼後湧，(c) 花團緊湊，(d) 莫名其妙。
2. 以下哪個句子语法有誤？(a) 小陳被挨了打之後，再也不敢惹是生非。(b) 今天趁著大家都在，讓我們把話攤開來說。(c) 今年中秋我們不烤肉，用剝文旦和吃月餅取而代之吧。(d) 你在大家面前反駁他，不啻當眾給了他一巴掌。
3. 蘇軾〈水龍吟〉一詞：「似花還似非花，也無人惜從教墜。拋家傍路，思量卻是，無情有思。縈損柔腸，困酣嬌眼，欲開還閉。夢隨風萬里，尋郎去處，又還被、鶯呼起。不恨此花飛盡，恨西園、落紅難綴。曉來雨過，遺蹤何在，一池萍碎。春色三分，二分塵土，一分流水。細看來，不是□□，點點是離人淚。」空格宜填入(a) 梅花，(b) 菊花，(c) 楊花，(d) 桃花。
4. 「每到夏天，我就開始酗芒果，浸溺在各種香氣和甜汁裡——世界上有上千個芒果品種，光是東南亞就有上百種，簡直讓人忙不過來。菲律賓的腰芒、呂宋芒，越南的雞蛋芒，緬甸的香蕉芒，海南島的椰香芒，泰國的水仙芒、皇帝芒、象牙芒，台灣的愛文、海頓和金煌……，各有各的活色生香，每顆芒果都是一部迷你的_____，抄錄當地的土質季風和雨水，收攝了天地精華，除了香和甜，我還吞進各種經緯的熱帶陽光。」(蔡珠兒，〈酗芒果〉) 空白處應是：(a) 電話簿，(b) 地方志，(c) 旅遊手冊，(d) 百科全書。
5. 《世說新語》是中國志人名著，內載：「何晏七歲，明惠若神，魏武奇愛之。因晏在宮內，欲以為子。晏乃畫地令方，自處其中。人問其故？答曰：何氏之廬也。魏武知之，即遣還。」這段文字應收於哪個分類之下？(a) 雅量，(b) 規箴，(c) 夙慧，(d) 巧藝。
6. 台灣詩壇的新詩，在日據時期反映了被壓迫者的反抗心聲，其中以賴和曾經發表在《臺灣新民報》描寫霧社事件的哪首詩最為動人？(a) 〈鄉愁四韻〉，(b) 〈狼之獨步〉，(c) 〈紅塵荒野〉，(d) 〈南國哀歌〉。
7. 亞歷山大大帝深明此理，有人請他解一團百年無人能解的死結，他是一劍劈開的。」(王鼎鈞《人生試金石·焦尾琴》)「此理」所指為何？(a) 勇敢，(b) 大方，(c) 果決，(d) 慎思。
8. 李煜〈浪淘沙〉寫道：「獨自莫憑欄，無限江山。別時容易見時難，流水落花春去也，□□□□！」空格應填入哪一選項？(a) 難以再見，(b) 天上人間，(c) 千里嬋娟，(d) 屢見不鮮。

二、填充：(請將名句、詩詞的空格填入正確的原文，每題4分)(20%)

1. 好學近乎知，力行近乎仁，()。(《禮記·中庸》)
2. 士不可以不弘毅，()而()。(《論語·泰伯》)
3. 高山仰止，景行行止。雖不能至，然()。(《史記·孔子世家》)
4. ()，志在千里；烈士暮年，壯心不已。(曹操〈步出夏門行·龜雖壽〉)
5. 眾裡尋它千百度，驀然回首，那人卻在()處。(辛棄疾〈青玉案·元夕〉)

三、作文：(40%)

前陣子有博士生開業賣雞排，被知名企業董事長認為他是「浪費教育資源」。其實，當我們身處職場時，也常會面臨理想與現實有所落差，請你以「職場與我」為題，寫作一篇自己對職場的看法。