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國立清華大學 108 學年度碩士班考試入學試題

系所班組別：奈米工程與微系統研究所 乙組  
考試科目(代碼)：科技英文(2102)

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共 14 頁，第 1 頁 \*請在【答案卷、卡】作答

SECTION 1, 15 Questions, 2% each

Question 1-15 are incomplete sentences. Beneath each sentence are four words or phrases marked (A), (B), (C), and (D). Choose one word or phrase which best completes the sentence.

1. If we \_\_\_\_\_ pepper, the soup would have been tastier.  
(A) had added  
(B) add  
(C) don't add  
(D) could add
  
2. My brother lives \_\_\_\_\_ a farm.  
(A) within  
(B) in  
(C) on  
(D) At
  
3. Vasco Nunez de Balboa \_\_\_\_\_ the Pacific Ocean in 1513.  
(A) discovered  
(B) was discovered  
(C) discover  
(D) had discover
  
4. For a variety of reasons, many American young adults are returning home or not leaving home at all, \_\_\_\_\_.  
(A) which makes families react in different ways to this  
(B) which has made families to react in different ways  
(C) to which makes families react in different ways  
(D) which is making families react in different ways

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共 14 頁，第 2 頁 \*請在【答案卷、卡】作答

5. When he was going away for the weekend, he \_\_\_\_\_ his neighbor water the lawn.
- (A) has
  - (B) had
  - (C) requested
  - (D) got
6. Traveler's checks are useful when one is travelling because \_\_\_\_\_ people refuse to accept them.
- (A) quite a few
  - (B) many
  - (C) few
  - (D) a few
7. Your friend won't be late, \_\_\_\_\_?
- (A) won't they
  - (B) will they
  - (C) isn't it
  - (D) is it
8. \_\_\_\_\_, guns had been made by skilled gunsmiths, one at a time.
- (A) In 1798, Eli Whitney camp up with a new idea
  - (B) In 1798, when Eli Whitney camp up with a new idea
  - (C) Until 1798, when Eli Whitney camp up with a new idea
  - (D) Since 1798 Eli Whitney had been working on a new idea
9. We usually expect that \_\_\_\_\_ bring bad news.
- (A) telegram
  - (B) a telegram
  - (C) the telegrams
  - (D) telegrams

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共 14 頁，第 3 頁 \*請在【答案卷、卡】作答

10. Not only did many people volunteer to bring food for the picnic, \_\_\_\_\_.
- (A) but also drinks and games
  - (B) many people did not offer to bring drinks and games
  - (C) many people offered to bring drinks and games
  - (D) they brought food
11. You \_\_\_\_\_ better study a lot next week, if you want to get through the exam.
- (A) had
  - (B) should
  - (C) will
  - (D) must
12. When he was a young boy, he used to wish he \_\_\_\_\_ a firefighter.
- (A) became
  - (B) is
  - (C) was
  - (D) were
13. Paterson was angry \_\_\_\_\_ his friend and threw a book at him.
- (A) on
  - (B) about
  - (C) at
  - (D) with
14. Had I run out of gas, I \_\_\_\_\_ called the garage.
- (A) would
  - (B) had
  - (C) would have
  - (D) should have

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共 14 頁，第 4 頁 \*請在【答案卷、卡】作答

15. While my brother has excellent eyesight, he \_\_\_\_\_ hard of hearing.

- (A) has
- (B) was
- (C) is
- (D) isn't

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共 14 頁，第 5 頁 \*請在【答案卷、卡】作答

**SECTION 2, 20 Questions, 2.5% each**

**In question 1~20 each sentence has four underlined words or phrases. Choose one word or phrase which is incorrect and must be changed to make the sentence correct.**

1. The professor managed to attending to the needs of his family while working day and night for the prestigious award.  
(A) attending  
(B) working  
(C) of  
(D) the
2. A few and the 50 stamps that my sister had were either for sale or for trade.  
(A) and  
(B) trade  
(C) were  
(D) the
3. "The Starlight Cafe" is a good place for order seafood but not to order meat.  
(A) is  
(B) for  
(C) but  
(D) not
4. The lab's conversational desktop is a voice-controlled computer system that acts like an automatic receptionist, personal secretary, and travel agent which screening all calls, taking messages, and making airline reservations.  
(A) which  
(B) lab's  
(C) that  
(D) is a

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共 14 頁，第 6 頁 \*請在【答案卷、卡】作答

5. The legendary Robin Hood used to steal from the rich people to give to all poor.  
(A) the  
(B) all poor  
(C) to  
(D) used
6. In the event something happening to the family, the lawyer assured her that the house would go to her friend.  
(A) the lawyer  
(B) go to  
(C) to  
(D) the event
7. Noise is external and excessive stimulus that increases rather than decreases your tension.  
(A) than  
(B) rather  
(C) increases  
(D) external and excessive
8. Having spent his childhood longing for books, Andrew Carnegie realized their value and went on to become the largest donor of funds the American public library system has ever had donors.  
(A) went on to become  
(B) having spent  
(C) the American  
(D) had donors

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共 14 頁，第 7 頁 \*請在【答案卷、卡】作答

9. Peter Weir, the prominent Australian filmmaker and screenplay writer, and was planning to visit the United States to make a film.
- (A) the prominent
  - (B) make
  - (C) was planning
  - (D) and
10. While most Americans may admire a person who speaks more than one language, most of them do not place any value on learning another language themselves.
- (A) on
  - (B) speaks
  - (C) themselves
  - (D) language
11. My grandmother could never understand why I preferred a 20-stories building to a rambling house in the fields.
- (A) 20-stories
  - (B) to
  - (C) in
  - (D) preferred
12. Hunger is not an unavoidable phenomena as are death and taxes.
- (A) not
  - (B) taxes
  - (C) hunger
  - (D) phenomena



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共 14 頁，第 8 頁 \*請在【答案卷、卡】作答

13. Coastal erosion is the only natural process that has altered the world's shorelines ever since the oceans formed first some three billion years ago.
- (A) the only
  - (B) process
  - (C) has altered
  - (D) formed first
14. Surveys note however, that the elderly are frequent victims of certain types of crimes, like purse-snatching.
- (A) crimes
  - (B) note
  - (C) like
  - (D) purse-snatching
15. Thousands years ago, the world had several ice ages; or periods of time when the climate was very cold and thick sheets of ice covered much of the earth.
- (A) thousands
  - (B) ages
  - (C) much of
  - (D) periods
16. Even among the general public, consciousness has been raised high enough so that any sporting finery made from the skins of an endangered animal run the risk of at least a verbal assault.
- (A) run
  - (B) so that
  - (C) has been
  - (D) verbal

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共 14 頁，第 9 頁 \*請在【答案卷、卡】作答

17. Only one egg hatched after twenty-eight days, while all the others hatched after twenty-ninth day.

- (A) the
- (B) while
- (C) others
- (D) twenty-ninth day

18. Although the poor families are fast learning the new trade, the lack of education are hampering their advancement.

- (A) lack of
- (B) are
- (C) fast learning
- (D) their

19. I have been having headaches so often later that I think I ought to see a doctor.

- (A) later
- (B) ought to
- (C) that
- (D) have been

20. The entire city except the western section is being plunge into darkness for the night.

- (A) being plunge
- (B) entire city
- (C) is
- (D) except

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共 14 頁，第 10 頁 \*請在【答案卷、卡】作答

## SECTION 3, 10 Questions, 2% each

Read the passage and choose the best answer to each question.

### Laser-Beaming the Internet of the Future

Aida Akl

Voice of America

Oct. 15, 2015

Several tech companies are looking at laser or a combination of radio and laser technologies to take Internet connectivity the next level. Spearheading the effort are Google and Facebook. Google, which is deploying helium balloons in the stratosphere to provide Internet connectivity in remote areas as part of Project Loon, wants to use radio or laser to enable its balloons to transfer data in areas that are far from ground relay stations. Facebook wants to launch drones that use laser beams for high-speed Internet connectivity in remote regions. The idea is that the drone closest to urban areas would use laser to connect to the Internet and then pass along the connection to drones flying over rural areas.

“Both Google and Facebook think that if they can operate these aircraft in the stratosphere, roughly 20 kilometers above the Earth, they could kind of function like aerial cell towers and spread the connections more easily and without having to figure out the power and the cabling and everything on the ground,” said Tom Simonite, the San Francisco Bureau Chief of the MIT Tech Review.

Facebook, in particular, is very interested in using laser to transfer data. “They claim to have set a new record and made the fastest laser data transfer ever,” said Simonite. “And I just think it shows that they are taking it seriously and are trying to push the technology forward.”

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共 14 頁，第 11 頁 \*請在【答案卷、卡】作答

Other companies are coupling laser technology with radio redundancy to deliver uninterrupted Internet connectivity in inclement weather. In that kind of situation, Simonite said both laser and radio connections run in parallel, so that the laser can pick up any slack in case of radio interference. "They're extremely fast," he said, "but if anything gets in the path of the beam, the signal is blocked." If the laser cannot travel in a straight line, the radio side would cover the deficit. "So it's like a redundancy thing so that they always have a connection that's live," he said. But the need to use both radio and laser simultaneously can be limiting, said Simonite. He said "lasers can be used to fuller potential" with project like the ones Google and Facebook are undertaking.

Light emitted by lasers can be modulated at very high speeds and can carry more than a petabit of data per second. A petabit is 1,000 terabits. A terabit equals a mind-boggling one trillion bits. The average U. S. Internet connection speed topped 11.7 megabits per second in the last quarter of this year, according to Akamai's State of the Internet Report.

The technology is promising for developing countries and in parts of the world where laying cables is difficult, where cables are easily damaged, or in rural areas where labor and materials tend to be expensive. Simonite said governments and cellular carriers now want to push their coverage into new, unsaturated regions. "And it looks like this technology could help maybe with that in places where the regular way of connecting up cell towers with cables and so on doesn't really work so well," added Simonite.

Laser technology is not new, however. Professor Siddharth Ramachandran of Boston University's Nanostructured Fibers & Nonlinear Optics Lab, said laser, a critical feature of Internet connectivity, has been used for communications since the late 1970s. One company, in particular, Washington-based TeraBeam was interested in the idea of free-space laser communications back in 2004.

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共 14 頁，第 12 頁 \*請在【答案卷、卡】作答

Ramachandran speculated TeraBeam wanted to use 1550nm laser light, which is considered “eye-safe.” It is unclear, however, if it is hazardous when used at higher levels of power in free-space communications. “The main reason I believe Terabeam planned to use 1550nm light is because most of the terrestrial and undersea fiber-optic communications equipment operates at this wavelength, which means it would be cheaper to piggy back on a lot of the technological infrastructure that was already developed,” he said. “And while modern communications systems, (such as, for example Cable Television applications) transmit a lot of laser power through the fibers or devices in the system, the laser beam seldom exits packaged devices so as to be directly harmful to human beings,” he said. Moreover, Ramachandran said laser beams connecting consumers with fiber-to-the-home applications “that promise massive bandwidths to each user, are low enough in power to not be a health concern generally.” Propagating light in free space to wirelessly transmit data has the same advantages as wireless or satellite links, but will be more expensive. But Ramachandran said the costs could drop if the market is looking for the kind of higher bandwidth that laser-based free-space communications will provide.

1. What is the topic of the passage?

- (A) efforts to expand internet connectivity
- (B) laser technology
- (C) operating aircraft in the stratosphere

2. In the first paragraph, what is NOT the meaning of the word “Spearheading”?

- (A) leading
- (B) following
- (C) driving

3. In the fourth paragraph, what is the meaning of the word “coupling”?

- (A) Separating
- (B) Pairing
- (C) increasing

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4. In the fifth paragraph, why does the author provide information about current U.S. Internet speed?

- (A) to show that current internet speed is fast
- (B) to show that current internet speed needs to be faster
- (C) to contrast the faster laser internet speed

5. In the second paragraph, what does the word “aircraft” refer to?

- (A) helium balloons and drones
- (B) drones and airplanes
- (C) airplanes

6. In the fourth paragraph, what is the meaning of the words “radio redundancy”?

- (A) using radio only as a backup
- (B) using only radio
- (C) using radio at the same time

7. In the third paragraph, what does the word “They” refer to?

- (A) Google and Facebook
- (B) Facebook
- (C) Google

8. What is NOT a reason TeraBeam wanted to use 1550nm laser light?

- (A) Much of the infrastructure has already been developed.
- (B) The laser light should be safe.
- (C) The company has drones to use the new technology.

9. How high above earth do Facebook and Google want to operate their aircraft?

- (A) approximately 20 km
- (B) approximately 1550 meters
- (C) as high as possible

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10. Where does the sentence “Lasers used in communications typically operate at 850 and 1550 nanometer wavelengths or colors of light, which are invisible to the human eye.” best belong?

- (A) at the end of the seventh paragraph
- (B) at the beginning of the fifth paragraph
- (C) at the end of the third paragraph