國 立 清 華 大 學 命 題 紙

99 學年度 工業工程與工程管理學系工業工程組丙組 碩士班入學考試

科目 人因工程 科目代碼 1602 共 2 頁第 1 頁 *請在【答案卷卡】內作答

1. To design a webpage for elder users,
   (a) What kinds of screen design issues or factors will you consider? (5%)
   (b) Take one of the issues or factors you are interested and plan an experiment to compare two different webpage designs. (10%)
2. In the selection of warning and alarm signals,
   (c) List any 5 general design recommendations for "tone" warning signals (5%)
   (d) Discuss the effectiveness of "tone" warning signals, "vocal" warning signals and "synthesized speech" warning signals. (10%)
3. According to your human factors and ergonomics knowledge and/or experience, please list and explain all the methods of measuring physiological strain. Please also describe any relationship between/among these methods. (12%)
4. You are a product designer and are in charge of designing following electronic devices. You are now preparing a design proposal to be submitted to your boss. For entering alphanumerical data into these devices, please suggest the most suitable data entry device and rationalize your choices from human factors and ergonomics point of view. (10%)
   (a) A laptop computer.
   (b) A mobile phone with GPS functions.
5. In order to help the operators best perform a control room task, it is required that the control/display components and the furniture must be ergonomically arranged and designed. What are the types of data that the designers must collect before design? (10%)
6. Define the following terms: (Total 8%, 2% each)
   (a) Work-space envelop.
   (b) Carpal tunnel syndrome.
   (c) Location coding of controls.
   (d) Anthropometry.
7. Choose the best answer (15 questions, Total 30%, 2% each).
   Please be sure to draw a table as below on your answer sheet.

Question	(1)	(2)	(3)	(4)	(5)
Answer					
Question	(6)	(7)	(8)	(9)	(10)
Answer					
Question	(11)	(12)	(13)	(14)	(15)
Answer					

(1) ( ) A vivid red light spot like a laser pointer would have CIE chromaticity coordinate (x, y) approximately at: (1) (0.3, 0.3), (2) (0.5, 0.5), (3) (0.7, 0.3), (4) (1.0, 0.0)

(2) ( ) The illuminance at 10 m. from a point light source is 1 lux, the luminance intensity of the light source is (1) 1 lm, (2) 100 lm, (3) 1 cd, (4) 100 cd.

(3) ( ) Which of the following light sources has the highest color rendering index: (1) mercury, (2) tungsten, (3) sodium, (4) the sun.

(4) ( ) Which of the following spectral lights has the highest luminous efficacy: (1) 360 nm, (2) 460 nm, (3) 560 nm, (4) 660 nm.

(5) ( ) In a high summer noon, I entered a car which had been parked under the sun for two hours, I felt very very hot, and fully sweeted immediately. The primary heat gain is via: (1) air temperature, (2) air humidity, (3) radiation, (4) evaporation.

(6) ( ) The original ET of 21°C has a relative humidity of how much when the air temperature is at 21°C? (1) 100%, (2) 75%, (3) 50%, (4) 25%.

(7) ( ) When our body's heat gain is 50 Kcal, our core temperature would be approximately (1) 36.5°C, (2) 37.5°C, (3) 38.5°C, (4) 39.5°C.

(8) ( ) A man is working in a hot environment, he is heavily sweeted, his Heat stress index could be: (1) 25%, (2) 50%, (3) 150%, (4) none of above.

(9) ( ) In a calm winter, the air velocity is almost zero, the air temperature is –10°C, the wind chill index would be: (1) –0°C, (2) –10°C, (3) –20°C, (4) –30°C.

(10) ( ) A room has a SPL of 50 dBA - 2 seconds, then 60 dBA - 2 seconds, 70 dBA - 2 seconds, 80 dBA - 2 seconds, 90 dBA - 2 seconds, its SEL would be most close to (1) 65dBA, (2) 75 dBA, (3) 85 dBA , (4) 95dBA.

(11) ( ) Effective quiet is (1) no temporary hearing loss, (2) no permanent hearing loss, (3) no temporary threshold shift at 2 min., (4) no temporary threshold shift at all.

(12) ( ) Which of the following sounds is the most annoying, all of them have the same SPL, but different frequencies (1) 20Hz, (2) 200Hz, (3) 2000Hz, (4) 20000Hz.

(13) ( ) According to OSHA, a noise dose of 50% is TWA = 85 dBA, and 100% is TWA = 90 dBA, now the noise dose of 200% would be (1) 95 dBA, (2) 100 dBA, (3) 105 dBA, (4) 110 dBA.

(14) ( ) ISO 2631 vibration standard is mainly based on (1) the boundary for reduced comfort, (2) the boundary for fatigue-decreased proficiency, (3) the boundary for safe exposure, (4) all of above.

(15) ( ) We are most tolerable to (1) $+G_x$, (2) $-G_x$, (3) $+G_z$, (4) $-G_z$ linear acceleration.