IE-341
Section 1, CRN: 30512
Section 2, CRN: 30515
First Semester 1432-33 H (Fall-2011) – 3(2,1,2)
HUMAN FACTORS ENGINEERING

Wednesday, Oct 26, 2011 (28/11/1432H)

MIDTERM 1 ANSWERS [10 POINTS]

Name:	Student Number: 42	Section: 8:00 / 11:00

Place the correct letter in the box at the right of each question [$\frac{1}{2}$ Point Each]

1. **Proper lining up of displays with respect to control knobs is an example of** **C**
   a. Movement Compatibility
   b. Conceptual Compatibility
   c. Spatial Compatibility (*see slide 16*)
   d. Modality Compatibility
   e. General Compatibility

2. **Which of the following is an example of a representational display?** **E**
   a. traffic lane
   b. traffic sign
   c. emergency signal
   d. traffic light
   e. map (*see slide 7*)

3. **When is auditory presentation preferred over visual presentation?** **D**
   a. when the delivered message is long
   b. when no immediate action is required
   c. when the message deals with location in space
   d. when a job requires moving around continuously (*see slide 8*)
   e. when the delivered message is complex

4. **Precision work performed while the person is standing requires…** **B**

a. the work-surface height to be below elbow height

b. the work-surface height to be slightly above elbow height (*see slide 13, 14*)

c. the work-surface height to be at elbow height

d. the work-surface height to be at shoulder height

e. the work-surface height to be at waist height

5. **In situations involving non-critical work …** **B**

a. designing for the 5th percentile person is preferred

b. designing for the average person is preferred (*see slide 19*)

c. designing for the 95th percentile person is preferred

d. designing using an adjustable range is preferred

e. designing for either the 5th or 95th percentile (depending on situation) is preferred

6. **What is the "popliteal height"?** **C**

a. the distance from the underside of the foot to the elbow (while sitting)

b. the distance from the underside of the foot to the shoulder (while standing)

c. the distance from the underside of the foot to the underside of the thighs (while sitting) (*see slide 6*)

d. the distance from the underside of the foot to the top of the thighs (while sitting)

e. the distance from the underside of the foot to the top of the head (while sitting)

7. **Which of the following is NOT TRUE regarding Human Factors Engineering?** **E**

a. machines are built to serve humans

b. the human is the most important component of a human-machine system

c. design of equipment will always have a great influence on humans

d. humans and machines must always be considered as interrelated

e. while designing, data regarding humans can sometimes be deduced (*see slide 5*)

8. **The *Mars Rover* (below) is an example of what type of human-machine system?** **A**

a. automated system (*see slide 9*)

b. semi-automatic system

c. mechanical system

d. manual system

e. boundary system

9. **Hmeidan scored the 25th percentile on an exam taken by 240 students; thus …** **E**

a. he received a score of 25/100 for that exam

b. he received a score of 25/240 for that exam

c. he scored more than 215 other people who took the exam

d. he scored less than 215 other people who took the exam

e. he scored more than 60 other people who took the exam

$$25^{th}\ percentile = \frac{25}{100} * 240 = 60$$

10. **What is the *probability of failure* of a system consisting of 5 components connected in parallel, each having a reliability of 30%?** **C**

a. 15.0%

b. 0.243%

c. 16.81%

$$prob.of\ success = 1 - \left(1 - Rel_{comp}\right)^N = 1 - (1 - 0.3)^5 = 1 - 0.7^5 = 1 - 0.16807$$

$$prob.of\ failure = 1 - prob.of\ success = 0.16807 = \mathbf{16.81\%}$$

d. 83.2%

e. 16.67%

11. **The "optimal area" suggested by Squires is the area …** **B / E**

a. involving the best working dimensions

b. of minimal stress on the elbow joint (*see slides 5,6*)

c. that can be conveniently reached by the forearm

d. reached by extending the arm from the shoulder

e. that takes into account interaction of elbow and forearm movement (*see slides 4,5*)

12. **The volumetric space within which individual works is called the …** **B**

a. working height

b. work-space envelope (*see slide 3*)

c. work surface area

d. work-surface height

e. working area

E

13. **Thigh clearance is determined by…**

a. distance between seat and top of work-surface

b. working height

c. seat height

d. work-surface height

e. distance between seat and bottom of work-surface (*see slide 11*)

14. **The success ratio for a machine that failed twice while working once every hour for 3 consecutive days is…**

A

a. 97.2%

$$success\ ratio = \frac{success}{total} = \frac{total - failure}{total} = \frac{(3*24)-2}{3*24} = \frac{70}{72} = 97.2\%$$ (*see slide 13*)

b. 2.78%

c. 66.7%

d. 33.3%

e. 93.3%

C

15. **In the Information Theory, a *Bit* is defined as …**

a. redundancy resulting from two events being equally likely

b. redundancy resulting from two or more events not being equally likely

c. reduction in uncertainty produced by two events being equally likely (*see slide 3,4*)

d. reduction in uncertainty produced by two events not being equally likely

e. reduction in uncertainty produced by two or more events being equally likely

C

16. **In the Information Theory, as *Redundancy* increases…**

a. departure from two events being equally likely approaches zero

b. departure from two or more events being equally likely decreases

c. departure from two events being equally likely also increases (*see slide 7*)

d. departure from two events being equally likely decreases

e. departure from two or more events being equally likely also increases

E

17. **What does the *Hick-Hyman* law state?**

a. there is a linear function between number of equally-likely stimuli and corresponding reaction time

b. there is a linear function between number of non-equally-likely stimuli and corresponding reaction time

c. there is a non-linear function between number of equally-likely stimuli and corresponding reaction time

d. there is a non-linear function between number of stimuli and corresponding reaction time

e. there is a linear function between number of stimuli and corresponding reaction time (*see slide 8*)

B

18. **How much information is involved with throwing a die (singular of dice)?**

a. 0.78 Bits

b. 2.58 Bits

since die has 6 equally − likely faces (i.e. events) ⇒

$H = \log_2 N = \log_2 6 = \frac{\log 6}{\log 2} = \mathbf{2.58\ Bits}$ (*see slide 4*)

c. 0.47 Bits

d. 1 Bit

e. 3 Bits

A

19. **A characteristic specified from the 5th to the 95th female percentile covers …**

a. 90% of the female population (since only the female population is involved)

b. 100% of the female population

c. 95% of the female population

d. 95% of the entire (male and female) population

e. 90% of the entire (male and female) population

D

20. **Standardization of codes allow the stimulus (stimuli) to be …**

a. detected by the sensory organs

b. differentiated from other stimuli

c. understood or learned quickly

d. used by different people in different situations (*see slide 13*)

e. used in addition to other coding stimuli