

Engineering 183EW Final Exam

June 9, 2018

1. A nominal estimate for the size of the world's population in the middle of the 21st century is approximately:
 - a. 5 Billion
 - b. 7 Billion
 - c. 10 Billion
 - d. 20 Billion
 - e. 30 Billion
2. A key factor putting additional demands on energy and other resources is the increasing levels of affluence (i.e., of individual wealth) in many countries.
 - a. True
 - b. False
3. Private car transport has gotten much more expensive in the US over the last 50 or 60 years, because a person must now work a longer time at the minimum wage to drive a mile.
 - a. True
 - b. False
4. Los Angeles decreased its level of smog in large part by combining new regulations on emissions with new technology to reduce emissions.
 - a. True
 - b. False
5. As far as we know, the previously observed problem of an annual increase in the size of a hole in the Ozone layer over the Antarctic solved itself naturally.
 - a. True
 - b. False
6. We have identified a number of gases as greenhouse gases. Which of the following is *not* an identified greenhouse gas?
 - a. Carbon Dioxide
 - b. Nitrous Oxide
 - c. Oxygen
 - d. Methane
 - e. Chlorofluorocarbons
7. Global warming has been predicted to cause a number of world effects, which of the following is *not* one of them:
 - a. Melting of ice caps
 - b. More severe weather events
 - c. Flooding of coastal areas
 - d. Societal unrest and conflicts
 - e. Darker nights

8. There is strong agreement in the US on the existence of climate change, its human causes and the need for technical solutions; this strengthens the country in dealing with the problems.
- True
 - False
9. One of the reason that recycling is not an optimum approach to dealing with waste is that the while the sale of recyclable material is a profitable business, it is also a dangerous one.
- True
 - False
10. The new Cradle-to-Cradle paradigm suggests several ways of improving our manufacture and use of technological products. Which of the following is *not* one of them?
- Rethink the first industrial revolution
 - Design products that have a very short useful life
 - Take nature as a guide
 - Construct buildings that produce more energy than they use
 - Incorporate materials that are known to be harmless

For each of the following descriptions, mark the letter of the associated person:

11.	Statistics of inherited characteristics	a. Charles Darwin
12.	The structure of the DNA molecule	b. Gregor Mendel
13.	Natural selection as process of species change	c. William James
		d. Nelson Mandela
		e. James Watson

14. Which of the following are important objectives for genetically modifying food crops?

1	Increased crop yield
2	Greater resistance to pests and disease
3	Less need for irrigation

- 1 and 2
 - 2 and 3
 - 1 and 3
 - 1, 2 and 3
15. A main argument for labeling genetically modified foods is that people have a right to know what possibly harmful ingredients are in the foods they buy.
- True
 - False
16. The new DNA editing technique called CRISPR-CAS9 has created much excitement because it seems to offer a path to controlling human evolution.
- True
 - False
17. In general, people are in strong agreement that it would be a good thing to be able to choose the characteristics of our children using DNA Engineering.
- True
 - False

61. Which of the following is true about the moral fairness requirement when attributing responsibility? A
- In forward-looking responsibility, a person should only be allocated a responsibility if she can live by that responsibility
 - In forward-looking responsibility, a person should only be allocated a responsibility if she has the means and the authority to fulfill her responsibility
 - Both a. and b.
 - Neither a. nor b.

62. Which of the following statements is true? A
- Sustainable development is about meeting the needs of presently living people without compromising the ability of future generation to meet their own needs.
 - Realizing a sustainable world implies that everybody will end up living in the same way.
 - If we want to achieve a sustainable society, we have to reduce our dependency on technology.
 - Engineers do not have to worry about the sustainability of their products, because it is the user who determines whether a product is used in a sustainable way or not

63. The collective accountability model as described in the textbook is:
- Attractive to large organizations because such organizations form a collective
 - Attractive to large organizations because then everybody watches over the behavior of others
 - Unattractive to large organizations because individuals cannot be held accountable according to the model
 - Unattractive to large organizations because individual differences in accountability cannot be taken into account.

What is a legal person?

- A fictitious person that has, for the law, the same rights and obligations as a real person
- A natural person that is representing a company, the state or other public bodies like a water board or a province
- A person that is living by the law
- The board of directors of a company

55. Mahatma Gandhi, the great Indian statesman and scholar, said:

"A principle is a principle, and in no case can it be watered down because of our incapacity to live it in practice. We have to strive to achieve it, and the striving should be conscious, deliberate and hard."

By this he meant:

- a. We should maintain our ethical framework even if we find its principles are hard for us to apply in the real world.
- b. We should adjust our ethical framework if we find its principles are hard for us to apply in the real world.
- c. While ethical principles are a nice thing to have, they should not get in the way of dealing with real problems

56. When is a risk-cost-benefit analysis carried out? B

- a. In assessing the acceptability of technological risks and in order to assess if a new proposed technology is the best available technology
- b. In assessing the acceptability of technological risk and in order to assess if the social benefits of risk reduction would outweigh the social costs of risk reduction
- c. In assessing the acceptability of technological risk and in order to assess if the risks and benefits of a new technology are justly distributed
- d. Both b. and c.

Negligence is often a legal condition for liability. In order to show negligence for the law, certain criteria must be met. Which of the following belong to these criteria? A

- a. Proof must be given that a duty owed has been breached
- b. A moral agent must have intentionally breached a duty owed
- c. Both a. and b.
- d. Neither a. nor b.

58. Which of the following is true about limited liability?

- a. Shareholders are personally liable for the caused damage, also beyond the value of their shares
- b. Shareholders are liable for the corporation's debt up to the value of their shares
- c. The liability of each individual shareholder will be determined based on her property and capital
- d. a. and c.

59. Collective responsibility implies that

- a. Every member of a collective body is only responsible for her own action
- b. Every member of a collective body is responsible for actions of all members
- c. The degree of responsibility of different members of organization depends on the place they have in the hierarchy of the organization
- d. None of the above

60. Which of the following statements is true about the Precautionary Principle? A

- a. It prescribes how to deal with threats of harm that cannot be scientifically established
- b. It prescribes how to deal with uncertainty in (technological) developments
- c. It prescribes that innovations may not bring any technological risks
- d. Both a. and b.

Dr. Weltman's friend, the actor James Cromwell, said: "One of the functions of a good movie or play is to mirror back to the audience a reflection of itself, so that the individual can recognize the choices the characters make and evaluate their effectiveness and appropriateness." The key meaning of his statement for continued ethical learning is:

- We can learn to tell good movies from bad movies
- Movies are frequently based on real life
- Evaluating the characters' choices empowers us to make better choices
- We know which characters to admire and which not to
- Plays and movies are sometimes different in their effects

52. We presented a case study from the Mad Men TV show that involved the actions of a small advertising agency's management in trying to obtain an important account. Which of the following ethical questions were raised by this particular case study?

1	Should a company accept a project that is outside its area of competence?
2	Should management's ethical decisions be passed on to lower level employees?
3	Is it ever right to compromise a company's ethical principles in the face of blackmail or for so called "good" business reasons?

- 1 & 2
- 1 & 3
- 2 & 3
- 1, 2 & 3

In the following two questions, identify which product design is the best choice and which is the worst choice in terms of its multi-attribute utility score. The table below gives the positive utility for each of 3 attributes on a scale of 0 to 100.

The weights associated with the positive attributes are:

Manufacturing Ease, $w_m = 0.5$

Attractiveness, $w_a = 0.2$

Ecological Impact, $w_e = 0.3$

$$10 + 18 + 7 = 35 \quad 35 + 24 + 15 = 76 \quad 40 + 11 + 8 = 69 \quad 25 + 12 + 12 = 49$$

	Utility Values			
	Design A	Design B	Design C	Design D
Manufacturing Ease	20	70	80	50
Attractiveness	90	30	55	60
Ecological Impact	80	80	60	40

53. The best choice in terms of multi-attribute utility score is:

- Design A
- Design B
- Design C
- Design D

54. The worst choice in terms of multi-attribute utility score is:

- Design A
- Design B
- Design C
- Design D

45. We have presented several components of ethical decision making and ethical practice. Which of the following was *not* one of them? **E**

- Sometimes ethics is more important than economics
- Ethical decisions should be the natural outgrowth of an ethical culture
- Ethics can often be considered as another factor in an analytical decision process.
- There is a difference between having ethics and being ethical
- Ethical considerations are completely separate from analytical decision making.

46. Which of the following have we suggested as criteria for separating unethical from ethical engineering failures? **C**

1	Maliciousness, i.e., prior knowledge and/or harmful intent
2	Fraudulence, i.e., false representation and/or suppression of true facts
3	Apathy, i.e. lack of concern for the results of a project
4	Oppression, i.e., imposition of power and/or denial of basic rights

- 1, 2 & 3
- 2, 3 & 4
- 1, 2 & 4
- 1, 3 & 4

47. In discussing potential professional conflicts of interest, such as hiring one's friends or relatives, we presented a number of factors to consider in resolving the issues involved. **E**

Which of the following was *not* included among them?

- How much are you likely to gain or lose
- How the situation fits into your personal ethical framework
- The effect of the resolution on fellow workers and/or colleagues
- The relevant company or organizational policy
- The likely attention given in the media

48. One of the reasons that whistle blowing can often lead to personal problems for the whistle blower is that our society has mixed feelings about "informing" or "tattling." **B**

- True
- False

49. Which of the following is *not* among the things the IEEE said a whistle blower should do to ensure that his or her action is successful?

- Choose the right opportunity to come forward
- Present a helpful approach, such as a solution to the problem
- Anticipate a personal attack and consider how to deal with it
- Find additional dirt on the guilty party or parties
- Prepare an escape route, perhaps even leaving the organization

50. We presented Experiential Humanities as a means of continued learning in the area of society and ethics. Which of the following did we present as key components of Experiential Humanities? **D**

1	Fiction and non-fiction literature
2	Tweets and Facebook posts
3	Movies, TV and drama
4	Current events from newspapers, magazines and interactive media

- 1, 2 & 3
- 2, 3 & 4
- 1, 2 & 4
- 1, 3 & 4

18. The inventor and writer Ray Kurzweil has postulated a Law of Computing that says we may never reach the absolute limit of computing power. A
- True
 - False
19. We used Magritte's picture of a pipe to make which point? A
- A simulation is not the same as the real situation
 - A picture is sometimes more accurate than a written description
 - There are as many different types of pipes
 - Don't believe everything your eyes show you
 - Pipes are as good a subject for a fine painting as anything else
20. While IBM's "Watson" is a powerful Artificial Intelligence machine, it was not able to defeat human champions at the knowledge game of Jeopardy. B
- True
 - False
21. People have identified "The Singularity" as the point in time when Artificially Intelligent entities become fully superior to humans. A
- True
 - False
22. It's clear Artificially Intelligent entities can never do jobs dealing with human contact or emotions because despite their superiority in computation, they are only machines. B
- True
 - False
23. Studies have shown that people are likely to be less truthful online than in person. A
- True
 - False
24. The suicide of young Megan Meier showed that it is difficult to punish unethical and harmful Internet behavior within the current system because: F
- Megan had prior psychological difficulties
 - There was no way to determine who was at fault
 - Too much time had passed
 - There were no available legal remedies for the case
 - The community did not care
25. Today, everyday acquisition and recording of personal data can be clearly separated from surveillance operations by law enforcement or government agencies. B
- True
 - False
26. We presented three ways in which *abuse* of databases can take place. Which of the following was *not* presented as one of these, but could possibly be included:
- Privacy: Adding to a database without permission.
 - Preclusion: Being prevented from accessing a database.
 - Preemption: Using a database for accusation of a future crime or terrorist act.
 - Piracy: Taking from a database without permission.

27. Dr. Weltman said that in the case of deciding whether to watch a pirated movie, the most relevant ethical consideration was:
- Rights Ethics
 - The 1st Amendment to the Constitution
 - The Categorical Imperative
 - The 5th Amendment to the Constitution
 - Pragmatism

28. Under the 4th Amendment to the U.S. Constitution, the Government has an unlimited right to search for and seize any and all personal effects of citizens suspected of serious crimes.
- True
 - False

29. HSSEAS Professor Leonard Kleinrock, an Internet pioneer, has said the reason he does not worry about privacy is because modern Internet technology can keep his personal communications and interactions completely secure.
- True
 - False

For each of the following program names, mark the letter of the corresponding definition.

30.	Upstream	a. NSA phone surveillance program
31.	Big Brother	b. CBS network data collection program
32.	Total Information Awareness	c. DARPA research and development program
		d. Foreign country's surveillance program
		e. George Orwell's "1984" surveillance program

33. Which US President first famously warned about the "acquisition... of unwarranted influence by the military-industrial complex?"
- John. Kennedy
 - Abraham Lincoln
 - Dwight Eisenhower
 - William Clinton
 - Lyndon Johnson
34. Most recently, America's expenditures on defense have been about equal to those of the next eight large world powers combined.
- True
 - False
35. We presented *four* fundamental "Rules of War." Which of the following was not one of them?
- Avoidance of unnecessary suffering
 - Discrimination between combatants and non-combatant
 - Necessity for military action
 - Providing immediate and unbiased information about actions
 - Proportionality of military action
36. The U.S. military has recently become involved with social media messaging primarily because worldwide terrorist organization such as ISIS are so good at it.
- True
 - False

37. Today's work on autonomous weapon systems, here and elsewhere, is fully consistent with scientist and writer Isaac Asimov's "Three Laws of Robotics." E
- True
 - False
38. Which US President said that only "an alert and knowledgeable citizenry" can ensure that the Government strikes the proper balance between security and liberty? E
- John. Kennedy
 - Abraham Lincoln
 - Dwight Eisenhower
 - William Clinton
 - Lyndon Johnson
39. In Naturalistic Decision Making a person uses such factors as previous experience and embedded heuristics ("rules of thumb") to quickly choose a course of action. A
- True
 - False
40. We presented a simple 4-part test for deciding if analysis was desirable in a decision making situation. Which of the following criteria was *not* part of that test?
- Some delay is possible
 - The decision involves personal elements
 - Accountability for the decision is desirable
 - The cost of an error is high
 - The situation is unfamiliar or problematic
41. The best definition of an Influence Diagram is a: E
- Schematic of political relationships in Washington, D.C.
 - More efficient way of representing decision trees
 - Convenient way of plotting biochemical reactions
 - Way of showing the societal effects of information
 - Map of gene locations on a DNA molecule
42. The most important lesson to be learned from the Martha Stewart case is: C
- Pay attention to what advisors are telling you
 - Don't buy stocks unless you really know the company's prospects
 - Consider the possible negative consequences of a decision
 - Don't worry about your past actions
 - Keep a close eye on current events
43. Research has shown that stress can greatly improve the effectiveness of the decision making process because it forces us to concentrate our attention. B
- True
 - False
44. We said that in decision making the most serious negative effect from the psychological phenomenon called "Resolution of Cognitive Dissonance" is:
- Searching for too much information
 - Failing to learn from bad decisions
 - Making decisions too quickly
 - Choosing the wrong option
 - Taking too long to make a decision

65. In March 1972 Holger Hsортsvang, Max Blakenzee, and Robert Bruder, three engineers, working on the Bay Area Rapid Transport Project (BART) in the San Francisco area and responsible for the design and creation of an automatic guided train system, were dismissed. These engineers had been expressing their doubts about the safety of the system via internal memos since 1969 to their managers. The response was "don't make trouble". In 1971 they brought their concerns in confidence to members of the board of directors, thus bypassing their immediate superiors. That was unconventional for the BART organization and indeed for any hierarchical organization. The director they finally made contact with turned out to be very interested in their case and so he promised to raise it with the management. He furthermore promised to keep their names anonymous and do nothing to damage their interests. However, two days after the encounter the full story was published in the Contra Costa Times. In this case, Holger Hsортsvang, Max Blakenzee, and Robert Bruder eventually spoke out their doubts about safety in public. How is such a kind of action called?

- a. Active responsibility
- b. Informed consent
- c. Paternalism
- d. Whistle blowing

66. According to the classic view on the responsibility of companies:

B

- a. Companies should formulate codes of conduct
- b. Companies should maximize their profits within the bounds of the law
- c. Companies should only make socially useful products
- d. Companies should talk to all relevant stakeholders and base their policies on those talks

67. In the textbook, four different strategies are mentioned for ensuring and/or improving the safety of a design. Which of the following answers provides a (not necessarily complete) list of these measures?

B

- a. Risk-cost-benefit analysis, inherently safe design, informed consent, negative feedback.
- b. Inherently safe design, safety factors, negative feedback, multiple independent safety barriers.
- c. Negative feedback, multiple independent safety barriers, informed consent, safety factors.
- d. Informed consent, risk-cost-benefit analysis, negative feedback, multiple independent safety barriers.

68. Systematic risk assessment

C

- a. is impossible because it requires putting a number on the value of a life.
- b. is morally unacceptable because it suggests certainty while risks are by definition unpredictable.
- c. does not necessarily lead to judgments about the acceptability of risk.
- d. None of the above.

69. Which of the following statements about responsibility is false?

C

- a. Technology does not affect a person's responsibility.
- b. Technology can be a barrier for a person taking responsibility.
- c. Technology can take over responsibility from a person.
- d. Technology can be used to (re)distribute responsibilities among people.

70. The main difference between negligence and strict liability is that:

- a. Strict liability requires culpability whereas negligence does not.
- b. Negligence is only about moral responsibility whereas strict liability is a kind of legal responsibility.
- c. Negligence requires culpability whereas strict liability does not.
- d. Strict liability is a kind of moral responsibility whereas negligence is a kind of legal responsibility.

71. According to the textbook, which of the following statements about the relation between the stand still principle and sustainability is true?

- a. The stand still principle is a strict interpretation of the Brundtland definition of sustainability, stating that we must not pass on a poorer environment to the next generation than the one we received from the previous generation.
- b. The stand still principle is a strict interpretation of the Brundtland definition of sustainability, stating that economic growth conflicts with sustainability and should therefore be avoided.
- c. The stand still principle is a concern that economic considerations will get priority over environmental considerations, such that no progress is achieved with respect to sustainability goals.
- d. None of the above.

72. In cost-benefit analysis, we sometimes apply contingent validation. This is:

- a. The use of discounting while realizing that the choice of discount rate is essentially arbitrary.
- b. Any validation of outcomes of the analysis is thus contingent upon this important choice.
- c. A way of expressing non-economic values in monetary terms by finding out how much people would be willing to pay to attain a certain level of these values. As such, the value of non-economic entities is contingent upon people's willingness-to-pay.
- d. The assignment of conditional qualifiers to input values into the cost-benefit analysis. As such, the analysis is robust, since it can adjust to contingencies in the real world and thus the validation of costs and benefits.
- e. None of the above.

73. One fundamental issue with cost-benefit analysis is that:

- a. It treats all values as intrinsic.
- b. It treats almost all values as intrinsic.
- c. It treats no values as instrumental.
- d. It treats almost all values as instrumental.

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4. In which of the stages of the design process (six in total) are the design requirements formulated?

- a. Decision stage.
- b. Problem analysis and formulation stage.
- c. Formulation of design requirements stage.
- d. Conceptual design stage.

5. One step in risk assessment typically consists of release assessment. Other steps are:

- a. Exposure assessment.
- b. Consequence assessment.
- c. Both a. and b.
- d. None of the above.

6. Informed consent:

- a. Can sometimes occur through the market.
- b. Can never occur through the market.
- c. Is irrelevant when there is a market.
- d. Is only possible in price elastic markets.

7. The ideal of intergenerational justice could be based on:

- a. The claim that future generations hold legitimate rights on non-renewable resources that are being exploited by the present generation.
- b. The claim that the present generation has a duty not to waste valuable resources
- c. The claim that it can be deduced from the precautionary principle
- d. All of the above.