Chapter 12 Review Questions Answer Key

1. What are the four Ds of robotics?

   A: Dull, Dirty, Difficult, or Dangerous

2. How does damage to a robot compare to damage to human workers?

   A: If we damage the robot, we can get replacement parts whereas a person requires medical care. A robot does not feel pain, it only knows what its sensors tell it and even then, the information is purely data. When a person receives damage, there is pain and suffering involved not to mention the possibility of scaring, surgery, rehabilitation, and permanent loss of mobility or function.

3. How do people and robots compare in terms of the effects of emotions on job performance?

   A: Robots are consistent and steady due to their lack of emotion whereas people get distracted, emotional, and compromised in other ways due to their emotions and thus their productivity suffers.

4. How does a robot's operating cost compare to the human labor cost?

   A: A midsized robot costs about 72 cents an hour to run when you figure in things like electricity, maintenance, programming, etc. At the writing of this book, the minimum wage in America is $7.25 an hour.

5. What are the three main points to remember when talking about the loss of human jobs to robots?

   A: First, if the business is not profitable it will not stay in business. Second, every robot needs a support staff. Third, many tasks are better suited to humans than robots.

6. What are the eight steps in a SWOT analysis?

   A: • Start with a focus

   • Do research

   • List company strengths

   • List company weaknesses

   • List opportunities

   • List threats

   • Establish priorities

   • Develop a strategy and execute

7. How do we figure ROI?

   A: We calculate this by taking the operating cost of the equipment and subtracting it from the amount of money it saves. Once we know the amount of profit or money made using the machine, we divide the total cost of the equipment by this number to determine how long it takes to pay for itself. If we figure it on a part-by-part basis, we would determine how many parts it needs to make in order to pay for itself and then turn that into a time scale using some correlation between parts produced and the time needed to produce them. If we are working on a cost savings vs. human labor then we simply figure the per hour savings and use that to get the total hours needed to pay for the robot. Once we have that figure we simply divide by the number of hours it runs per year or week to figure out the time for payback.

8. What are the options if the cost of the robot outweighs the return?

   A: One, we forget the robot and continue to do it the way it is currently done. Two, we can try to find a cheaper robot that will perform the task. Or three, we figure out a new way to use the robot.

9. How does using a robot help save on consumables such as paint or welding wire?

   A: The same factors that allow the robot to increase quality and precision in production also tends to optimize the use of materials, thus minimizing waste.

10. What are the down sides of PPE for human workers?

    A: The PPE has to protect the worker from the hazards of the task, can be less than comfortable for the wearer, and represents an added cost in the manufacturing process. On top of this, if the PPE fails it exposes the worker to a hazard of some kind.

11. What are the costs associated with a worker's injury on the job?

    A: On the job injuries can cost a company thousands if not millions of dollars. Even in cases where the medical expenses are not that high, the employer still has to find someone to do the work while the injured employee recovers and the injury could make the companies worker's compensation insurance premiums go up.

12. What are the potential costs and impacts of a worker fatality for the company involved?

    A: If someone dies on the job due to work related factors, OSHA immediately inspects the facility and investigates the death to figure out why it happened and how to prevent anyone else from being hurt or killed. This alone could cost the

company thousands of dollars in fines not to mention any lost production time if OSHA shuts the plant down until corrective actions are complete. Then there is the possibility of a wrongful death lawsuit by the family, which is another big expense. Insurance rates for the company are likely to increase, which is more money out of the company's pocket. Moreover, we cannot forget the impact it would have on the morale of the workers at the facility and all the costs that could have.

13. List some of the places robots can go that humans cannot.

    A: With our current technology and equipment, it is impossible to send a person below a set depth in the ocean as the pressure would crush them. To gather information or do research at these depths we need a machine. Without protective equipment and oxygen, humans cannot work in certain areas with toxic or low oxygen atmospheres. Current technology can only shield people from certain levels of radiation and even then, only for a finite amount of time. We have miles of buried pipeline that are too small for adults to fit through that require regular inspection.