

Module 4 Self Study Review of Reliability, Software Quality and Six Sigma

True/False/Multiple choice/Write-in Answers

1. One operational definition of reliability is the probability that a product or system will function on any given trial.

2. If a system is composed of two parts which must both operate, and each has a probability of .7 of operating, it is more likely than not that the system will fail.

3. The probability that a product will perform its intended function under prescribed conditions is:
 - A) reliability
 - B) merchantability
 - C) functionality
 - D) fitness for use
 - E) manufacturability

4. A system is comprised of two separate units which must both function in order for the system to perform as intended. The reliability of one is .4, and the reliability of the other is .5. The overall system reliability is:
 - A) .9
 - B) .3
 - C) .2
 - D) .1
 - E) .02

5. A product comprised of two components whose failure probabilities are .1 each, has a reliability of:
 - A) 1.8
 - B) .9
 - C) .81
 - D) .8
 - E) .2

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6. An early warning security fence has three major components which must each perform in order for the system to perform. Their reliabilities are .4, .3 and .2. The system reliability is equal to:
- A) .024
 - B) .076
 - C) .10
 - D) .336
 - E) .90
7. One of the solar instruments on a satellite has three major parts which must all operate. Two have reliabilities of .7 and the other has a reliability of .9. In case the system fails, there is an identical 3-part backup system which kicks on automatically. The overall reliability of the system, including the backup, is closest to:
- A) .30
 - B) .40
 - C) .50
 - D) .60
 - E) .69
8. A garage door opener has two components, which have reliabilities of .9 and .8, respectively. The less reliable component has an identical backup which automatically goes on if the original fails. Both components must operate to for the garage door to function. The system reliability is
- A) .576
 - B) .72
 - C) .64
 - D) .864
 - E) .9
9. A system is composed of two parts which must both operate in order for the system to perform as intended. The parts have reliabilities of .6 and .5. There is an identical backup system connected to the main system by a switch which has a reliability of .9. The probability that the overall system will operate is closest to:
- A) .30
 - B) .40
 - C) .49
 - D) .60
 - E) .70

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Use the following to answer questions 10-13:

The chief of the design team for a new missile wants to know the reliability of its guidance system. This system is comprised of three components: a gyroscope, which has a random failure rate of 3 in every 10 launches; a computer, which has a random failure rate of 2 in every 10 launches; and a rocket motor, which has a random failure of 1 in every 10 launches.

10. What is the probability that the gyroscope will perform reliably during a launch?
 - A) 0.3
 - B) 0.504
 - C) 0.7
 - D) 0.889
 - E) 0.91

11. What is the probability that the guidance system will perform reliably during a launch?
 - A) 0.3
 - B) 0.504
 - C) 0.7
 - D) 0.889
 - E) 0.91

12. If they were to connect an identical, backup gyroscope with a perfectly reliable switch to the primary gyroscope, what would be the reliability of the gyroscope function during a launch?
 - A) 0.3
 - B) 0.504
 - C) 0.7
 - D) 0.889
 - E) 0.91

13. If they were to connect an identical, backup gyroscope with a .90 reliable switch to the primary gyroscope, what would be the reliability of the gyroscope function during a launch?
 - A) 0.3
 - B) 0.504
 - C) 0.7
 - D) 0.889

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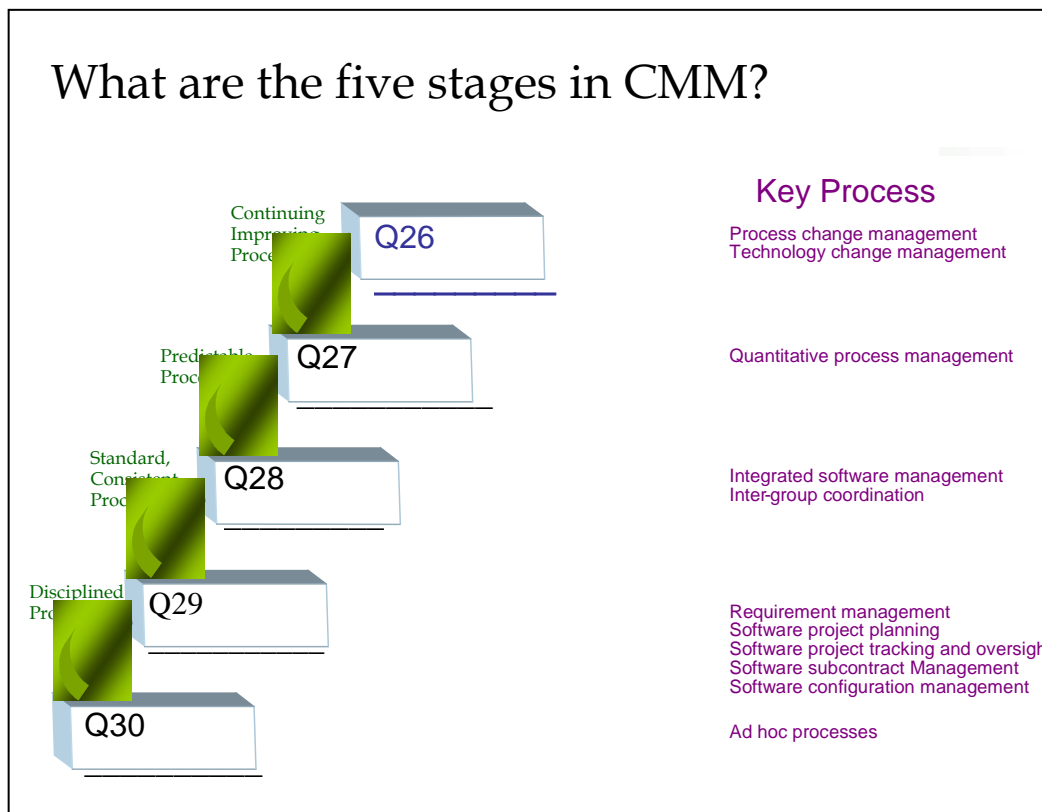
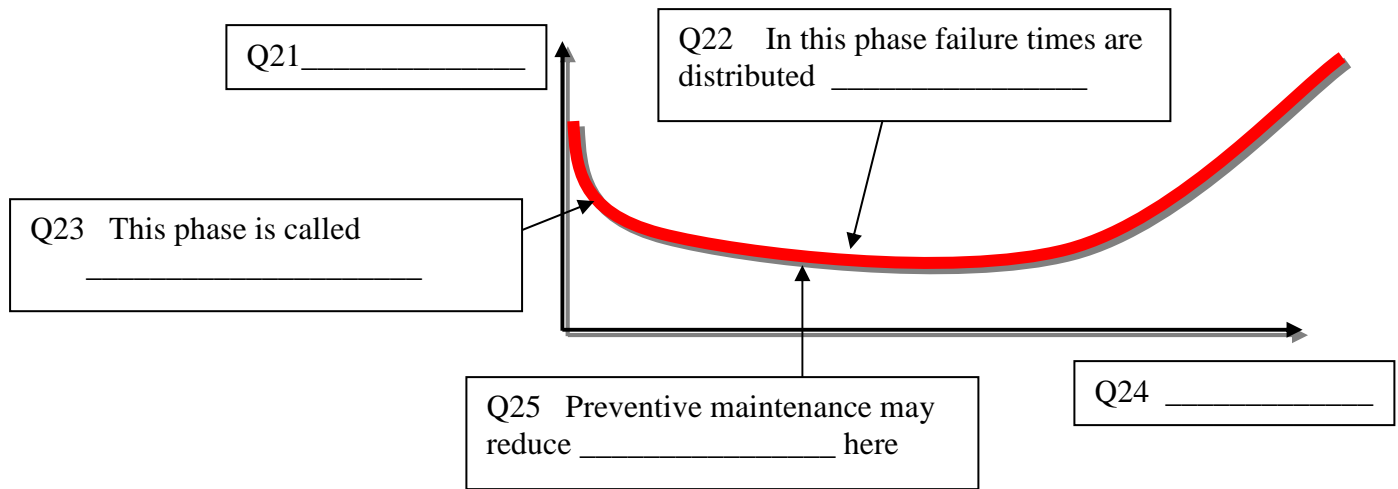
E) 0.91

Use the following to answer questions 14-20:

A certain product is comprised of two components: X and Y. Component X has a random failure rate of one in every ten years, while component Y's random failure rate is one in every five years. This product has a mean time to wear-out of eight years with a standard deviation of one year.

14. What is the probability that component Y will fail during a year of operation?
15. What is the probability that component X will perform reliably for a year?
16. What is the probability that component Y will perform reliably for a year?
17. What is the probability that this product will perform reliably for a year?
18. What would be the reliability of this product if component X were backed up with an identical component?
19. What would be the reliability of this product if component Y were backed up with an identical component?
20. What is the C_{pk} equivalent value of 6 Sigma performance?

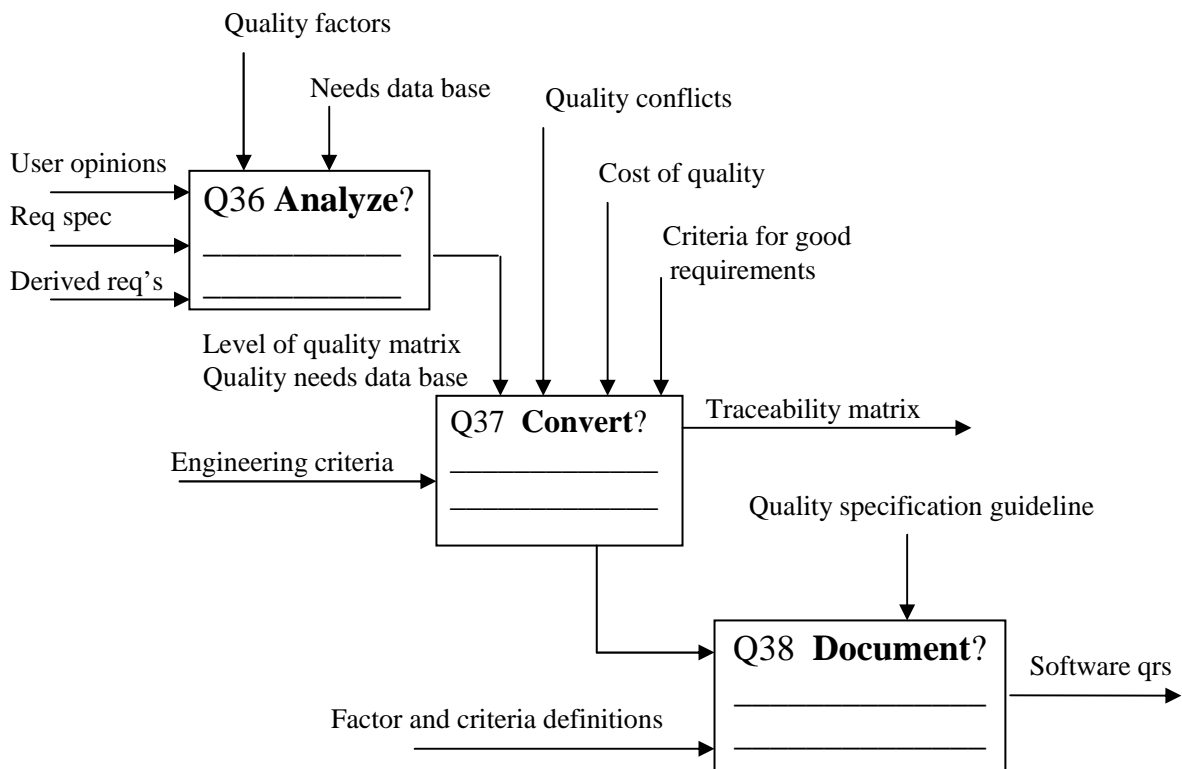
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Software "Rework" requires (supply the title of each step shown):

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- Q31. _____ Meets exit criteria
- Q32. _____ Author
- Q33. _____ Resolve all identified defects
- Q34. _____ Inspection defect list, Work disposition, Schedule for review
- Q35. _____ Worked upon work product, Documentation of defect resolution



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Q39. Structured Walkthrough is a(n)

- A) Requirements analysis step
- B) Client review step
- C) Evaluation of the finished product
- D) Code inspection step
- E) Project planning operation

Q40. The primary tool in SW quality control is

- A) QFD
- B) SPC
- C) Ishikawa diagrams
- D) Inspection and defect removal
- E) JAD