INCOSE Certification Program Knowledge Exam Update 2015

Courtney Wright, CSEP INCOSE Certification Program Manager
3023 Genessee Creek Lane
Friendswood, Texas 77546
Courtney.Wright@v1decisions.com

Abstract. The International Council on Systems Engineering (INCOSE) has offered a Professional Certification Program since 2004 as a means to recognizing the knowledge and experience of Systems Engineering professionals. To become an Associate Systems Engineering Professional (ASEP) or Certified Systems Engineering Professional (CSEP), a candidate must pass a timed, multiple-choice knowledge exam based on the INCOSE Systems Engineering Handbook. This paper will describe the motivation and process of creating the INCOSE certification knowledge exam, as followed in 2014 to support the 2015 update of the exam. This paper will also capture the impacts of the ongoing updates to the Certification Program. The new exam, released on 1 May 2015, aligns with the 2015 release of the INCOSE Systems Engineering Handbook version 4.

Background

INCOSE's Certification Program. The International Council on Systems Engineering's Certification Program provides independent measurement and recognition of individuals who have knowledge, experience, and/or leadership in the field of systems engineering. The Program is open to all individuals regardless of educational background, years of experience, or domain of work. Individuals may be certified as Associate Systems Engineering Professionals (ASEPs) based solely on knowledge and commitment to further professional development. They may become Certified Systems Engineering Professionals (CSEPs) by demonstrating knowledge and experience performing systems engineering on the job. The highest level of certification is the Expert Systems Engineering Professional (ESEP), who has demonstrated extensive experience and leadership within systems engineering and has a commitment to continue doing that in the future. Individuals may apply and enter directly into any level or they may progress through all three, from ASEP to CSEP to ESEP.

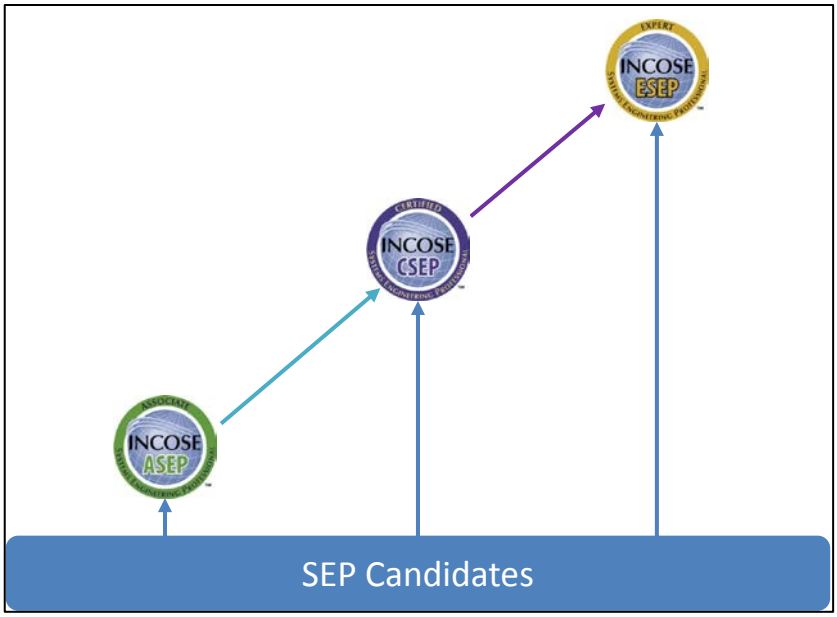

Figure 1. Certification Levels and Progression

Objectives of Exam Update

The INCOSE Systems Engineering Vision 2025 states a goal of broadening the base of systems engineering practitioners. Toward this end, the knowledge exam update encompassed participants with an eye toward ensuring the questions were not biased toward historical SE domains of aerospace / defense and hardware systems. This supports the Vision 2025 imperative: "Expanding the application of systems engineering across industry domains."
The fronts along which the SE discipline is expanding are listed on page 25 of the Vision as:

- *Diverse application domains such as consumer products, biomedical, healthcare, automotive, and energy production*
- *Geographic scope, both regionally and nationally*
- *Enterprises from small to medium to large*
- *Government projects and policy at international, national and local levels*
- *Breadth and scope of systems from individual systems to large scale system of systems*
- *Increased emphasis on downstream life cycle processes such as sustainment*

Updates to the knowledge exam sought a balance between keeping SE open to expanding domains, methods, and theory while retaining a baseline of knowledge expected of all SE's. This balance was achieved by taking care in what portions of the handbook are tested: not all portions of the handbook are on the exam, and the amount of text in the handbook does not directly determine how many questions on that topic are on the exam. With this independent relationship, it can be encouraged that all Systems Engineering Professional candidates learn about all that is in the SE Handbook but without requiring complete knowledge.
The second way in which this balance was found was through requiring less than 100% correct answers on the knowledge exam. As stated on page 42 of Vision 2025:

- *Systems thinking is used by many.*

- *Systems engineering is understood and embraced by all engineers.*
- *Systems engineering is a career for a few.*

INCOSE's Vision 2025 and the INCOSE Certification Program have both evolved from previously referring to "systems engineers" to now referencing "people who do systems engineering," which includes both the second and third bullets from the above list. An objective of the latest knowledge exam update and other changes within the Certification Program are to recognize those individuals who are knowledgeable and experienced and leaders in systems engineering, regardless of their job title. On both the SEP application, where experience is documented, and on the knowledge exam, there are no single areas of SE that are required, but there is a breadth of SE knowledge and experience that is required.
The Certification Program does not publish its passing score, but the example below suggests how different candidates might succeed on an exam requiring 75% correct answers.

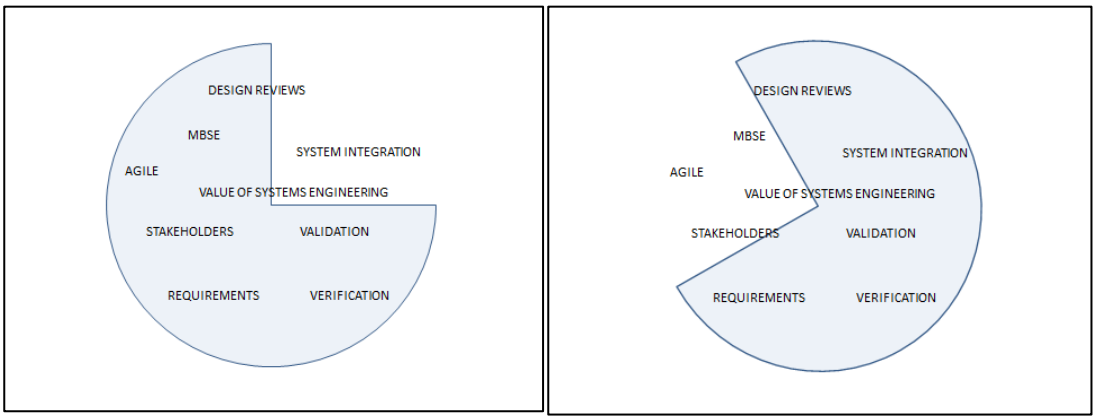

Figure 2. Knowledge Exam Coverage Example

Another version of this graphic could show a circle that was 75% the area of the whole circle, and placed in any position overlaying the words. Of significance, greater depth of knowledge in any one area is not sufficient to pass the knowledge exam or to meet the experience requirements for INCOSE Certification. There is a minimum requirement for depth of experience and knowledge, and there is also a minimum requirement for breadth of experience and knowledge. Neither can fully substitute for the other at any certification level (ASEP, CSEP, or ESEP).
As stated on page 17 of Vision 2025,

> *Systems Engineering is being adapted to support many application domains in both common and industry-unique ways. Embracing the diversity of practice while leveraging practices that deal with common system challenges enriches the discipline.*

Vision 2025 is a ten-year path for Systems Engineering and INCOSE to take. One of the expected documents following that path is the INCOSE Systems Engineering Handbook (SEH). Version 4 of the handbook was generated concurrently with Vision 2025.

Body of Knowledge for Exam

Content on the INCOSE knowledge exam traces directly to the INCOSE Systems Engineering

Handbook. Since the Certification Program began in 2004, the handbook has been revised from version 2a, to version 3.1, 3.2, and most recently to version 4. These changes have reflected increasing alignment to Systems Engineering standard ISO/IEC 15288, which has also been revised several times during that period. The 2015 knowledge exam update is necessary for the exam to be aligned with the INCOSE SE Handbook version 4 (SEHv4), with scheduled release in early 2015.

The latest update of the INCOSE SE handbook was made with an objective of fully aligning with a newly-released version of ISO 15288. Details on changes to both the INCOSE SE Handbook and ISO 15288 are presented in "INCOSE Systems Engineering Handbook Version 4: Updating the Reference for Practitioners," which will also be presented at the INCOSE International Symposium in 2015.

INCOSE Handbook Not Completely Captured by Knowledge Exam. All questions on the INCOSE knowledge exam can be traced to the SE Handbook, but not all aspects of the handbook will be found on the knowledge exam. Many reasons for this imbalance include:

- Time limitations – the knowledge exam has been offered as a two-hour, 120-question test since its initial offering. To test on the entire handbook would require a much longer exam, both in terms of number of questions and time given to answer them.

- Subject Matter Experts' Judgment – the list of knowledge expected for a Systems Engineering Professional (SEP) is generated from within the INCOSE Certification Program, while the handbook content is determined by its editors and the Technical Operations leaders within INCOSE. They may disagree on what a minimally qualified SEP should know.

- Experience Versus Cramming – the exam developers are not trying to trick anyone. The exam is developed such that experienced SE's who have not studied the handbook may still succeed on the exam, just as inexperienced individuals who have studied the handbook extensively may also succeed. All testable material must be both traceable to the handbook and aligned with what an experienced SE might have learned on the job. This is not to say that all or even most experienced SE's could pass without studying the handbook but rather that it should be possible for some to accomplish that.

Exam as Part of Overall Certification Process

As described on the INCOSE Certification website, the three levels of the certification represent a progression of education, knowledge, experience, and leadership in systems engineering. The knowledge exam is a requirement for the ASEP and CSEP certifications.

Table 1: Certification Requirements by Level

LEVEL	Experience	Education	References	Exam
	None Required	None Required	None Required	Same exam as CSEP, based on INCOSE SE Handbook
	Minimum 5 years SE experience	Technical Degree (can be augmented with additional years of experience without a technical degree)	3 references (cumulative coverage of the years of experience)	CSEP exam based on INCOSE SE Handbook
	Minimum 25 years (20 if CSEP) SE experience Minimum 5 years of professional development credit	Technical Degree (can be augmented with additional years of experience without a technical degree)	3 references (cumulative coverage of at least the most recent 10 years of experience) Support panel review, if required	No examination, panel review

Format of the Exam

The INCOSE Knowledge Exam's role in the Certification Program is to measure baseline knowledge. The most efficient way to do this is through a computer-delivered and computer-scored exam. This format is also notable for being repeatable and appropriate for a global audience. The following are characteristics of the exam questions:

1. If more than one answer is correct, the number of correct answers is stated in the question. (e.g., "choose three")
    a. The computer testing provider limits the candidate to entering that many answers
    b. If only one answer should be chosen, there is no notation in the question about how many to choose.
2. All questions are written in multiple-choice format. No true/false.

   a. Answers do not reference other answers. No “all of the above.”
   b. All questions have four or five multiple choice options.
3. All correct answers are traceable to handbook version 4.
4. All statements are positive, avoiding the word “not.” E.g., “Which three of the following are …?” instead of “Which two of the following are not …?”
5. Text is reviewed by non-native-English speakers to confirm its readability.
6. Acronyms are rarely used.

Each exam has 100 scored items. Multiple versions of the exam exist, and not all candidates will take the same version. Twenty additional unscored items are added to the computer-based test and fifty additional unscored items are put on the paper test. Those items are being evaluated for inclusion in future versions of the exam. The paper test also included ten items about candidate demographics.

Exam Update Process

The general process for creating a knowledge exam is similar to that of generating a top-down system requirements document. It starts with a Job Task Analysis (JTA), similar to a Concept of Operations and set of use cases. The JTA is then used to generate a list of learning objectives (LO’s) very similar to a system specification document. Once the LO’s are in place, subject matter experts are called upon to generate test questions that, if answered correctly, will distinguish between those who meet and fail to meet those learning objectives.

Details and a visual presentation of the exam update process were included in Dave Walden’s 2008 paper presented at APCOSEC.

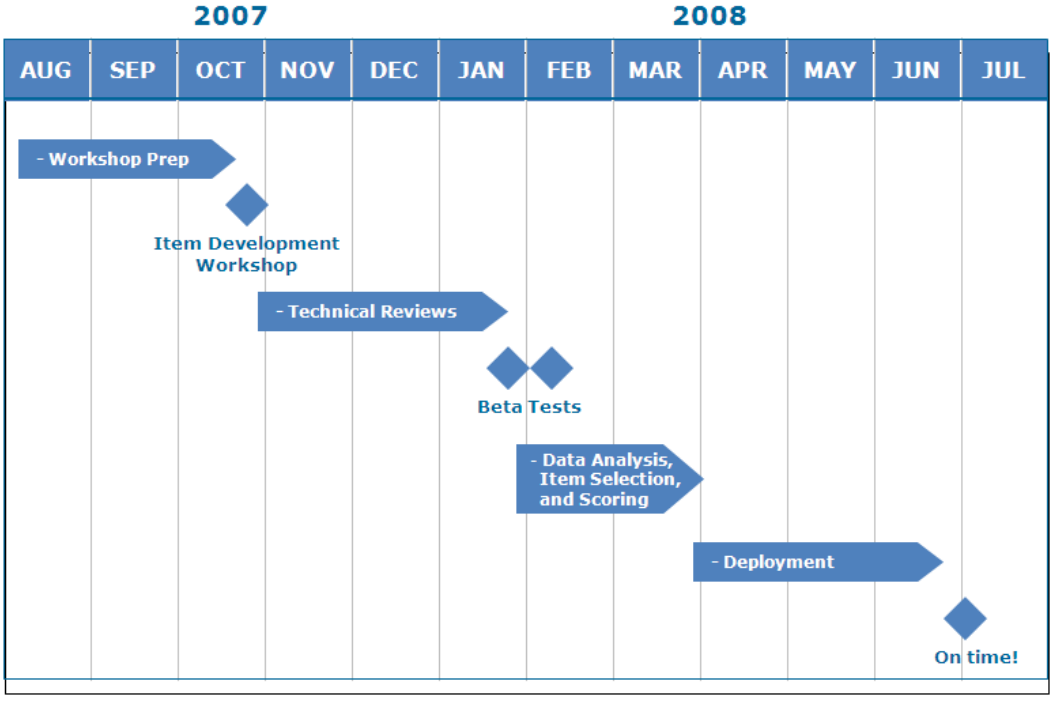

Figure 3. Development Timeline for 2008 Exam Update

The 2014 knowledge exam update focused on re-writing the exam questions within existing learning objectives. Another difference between the 2007 and 2014 updates is that the more recent item development (writing new questions) took place as a geographically-dispersed and self-paced activity rather than as a single gathering. SEPs who volunteered as authors were assigned topics upon which to write questions, rather than being allowed to choose topic areas in which they were experts. This was intentional to maintain a consistent level of difficulty across all topic areas. The authors submitted their questions, correct answers, and wrong answers (called "distractors") via a web-based tool. Subject Matter Experts were later brought in as teams to review the submitted items and to check the content's references in the handbook. No item on the exam was viewed by fewer than five subject matter experts, and all content is directly traceable to a section in the INCOSE SE Handbook version 4.

Knowledge Exam Offered Worldwide. Although INCOSE reviews Certification application materials in English, only, it is partnered with other organizations that have equivalent programs in other languages. Many individuals have taken and passed the INCOSE knowledge exam, as well as the application and interview processes, for whom English is a second or subsequent language. Additional time is available on the knowledge exam (if requested in advance) for non-native English speakers. Approximately one-fourth of INCOSE certification applicants come from countries where English is not the official language (Lipizzi et al 2015).

Projected Impacts of 2014 Exam Update

Applicants to INCOSE's Certification Program can be current INCOSE members, employees of INCOSE's Corporate Advisory Board organizations, or individuals with no previous affiliation with INCOSE. All will be impacted by the Certification Program's following the INCOSE Systems Engineering Handbook update, but those with existing ties to INCOSE may find the change more significant. This is because they will be comparing the old exam and handbook to the new one, making the differences noteworthy. General guidelines on preparing for the knowledge exam will remain unchanged, minimizing the impact to all others.

There are no intentional changes to the format of the exam, other than stricter adherence to the question format guidelines listed in a previous section of this paper. The content is changed a bit to align with updates in the INCOSE Systems Engineering Handbook version 4.

The primary impacts of the update are that it will draw more people to look at the updated SE Handbook. The new ideas in the SE Handbook will be distributed more quickly as a result of the handbook being the source of content for the knowledge exam than if the exam were to continue linking to previous versions of the handbook.

Secondary impacts of the update relate to the way it has been executed. Over fifty Systems Engineering Professionals volunteered to participate in the handbook update. Their roles included writing and reviewing new questions, and refreshing and checking references on old questions. Still more individuals volunteered to participate in the Beta exam and spent many hours each studying the INCOSE SE Handbook version 4. Both these groups became more knowledgeable about the INCOSE Systems Engineering Handbook and exam, and more engaged with INCOSE and the Certification Program.

Initial Results of the Beta Exam

The beta exams are being scored during the months of November and December 2014. In early 2015, the Certification Program will be able to release examples of questions that were discarded because they were too easy or too hard.

Too-Easy Example #1:

What is the purpose of the Operation Process?

A. plan for system disposal
B. optimize the maintenance process
C. ensure the quality of user training
D. use the system to deliver its services

The correct answer, D, came from section 4.12.1.1 in the INCOSE Systems Engineering Handbook version 4. In the beta exams, 94% of the candidates got this question right. On a pass/fail exam, it is not useful to publish a question that so many of the participants get right. This makes it a poor differentiator between qualified and unqualified candidates.

Too-Easy Example #2:

How may a system operator use a system to sustain engineering?

A. by reviewing verification analysis
B. by reviewing operator procedures
C. through monitoring system performance data
D. through monitoring the number of trained operators

The correct answer, C, was chosen by 72% of the candidates, but it was not the 72% most-qualified candidates. Highly-qualified candidates did not perform much better than the least-qualified candidates This answer comes from section 4.12.2.1 of the INCOSE Systems Engineering Handbook version 4.

Too-Easy Example #3:

What is the purpose of the Acquisition Process?

A. Establish verification criteria to satisfy a desired materiel solution.
B. Establish a quality assurance agreement between two test organizations.
C. Establish documentation of the details and interfaces of a proposed design.
D. Establish an agreement between two organizations under which one party obtains products or services from the other.

The correct answer, "D", was chosen by 98% of the participants. This answer comes from section 6.1.1.1 of the INCOSE Systems Engineering Handbook version 4.

Too-Hard Example #1:

What are three purposes of Technical Performance Measures (TPMs)? (Choose three)

A. Assess system quality.
B. Assess design progress.
C. Assess cost and schedule.
D. Enable effective management.
E. Monitor a set of critical requirements.

The correct answers, B, D, and E, come from section 5.7 in the INCOSE Systems Engineering Handbook version 4. In the beta exams, 17% of the candidates got this question right. This makes it, too, a poor differentiator between qualified and unqualified candidates.

Too-Hard Example #2:

What is a primary objective of systems engineering in the acquisition process?

A. to decide the customer needs
B. to minimize total ownership cost
C. to validate total system performance
D. to maintain needed customer capability

Twenty-two percent of the candidates correctly chose the correct answer "B," as found in section 2.6 of the INCOSE Systems Engineering Handbook version 4.

Unclear Example #1:

What is primarily a risk management process?

A. OOSEM
B. Rapid Prototyping
C. Agile Systems Engineering
D. Lean Systems Engineering

The correct answer, C, comes from section 9.9 in the INCOSE Systems Engineering Handbook version 4. In the beta exams, 31% of the candidates got this question right. This may seem to

make it an effective differentiator between qualified and unqualified candidates. Examining the results more closely, however, we find that more qualified candidates frequently got this question wrong, choosing answer B as correct.

Most of the candidates who correctly answered this question had fewer than ten years of experience working in systems engineering. Candidates who reported having ten or more years of SE experience fared worse on this question than did the other group, despite performing better on other items.

These results show that while this question is differentiating between two groups of candidates, the differentiation appears to be between those with more experience and those with less. It is not the intent of the Certification Program's knowledge exam to be harder for those who are more experienced. On the other hand, there are some newer areas of SE knowledge that are valuable and are more familiar to newer SE's. Those factors were considered in evaluating whether to include this in the item bank.

Unclear Example #2:

What are two appropriate motives for using Agile SE? (Choose two.)

A. to reduce costs associated with over-documenting a solution
B. to reduce the risks when the voice of the customer is not known
C. to enable reconfiguration of goals, requirements, and plans, predictably
D. to reduce the risks associated with accommodating beneficial requirements evolution

The correct answers, C and D, come from section 9.9.1 in the INCOSE Systems Engineering Handbook version 4. In the beta exams, 35% of the candidates got this question right. As with the previous example, this success rate was no more for qualified candidates than for unqualified candidates. This question did not differentiate between candidates in the desired way.

Unclear Example #3:

A biometric thumbprint reader opens a locked door.

In systems terms, what has occurred?

A. An emergent system behavior occurred
B. A binary logical value executed a process
C. A system element returned to steady state
D. A measurement assigned a value to a variable

Many qualified candidates incorrectly chose answer "A" as correct, instead of the SME-approved correct answer of "D." This topic is found in section 2.2.2 in the INCOSE Systems Engineering Handbook version 4.

Unclear Example #4:

Which are outputs of the Disposal Process?

A. Disposal Concept, Operation Analysis, Disposed System
B. Disposal Strategy, Disposal Constraints, Operation Report
C. Life Cycle Strategy, Validated System, Disposal Concept of Operations
D. Disposal Enabling System Requirements, Disposal Report, Disposal Record

The correct answer, "D", comes from section 4.14.1.2 in the INCOSE Systems Engineering Handbook version 4. The success rate for native English speakers was over 90%, while the success for non-native-English-speakers was less than 50%.

Unclear Example #5:

What are two potential outcomes of skipping life cycle stages and eliminating time consuming decision gates? (Choose two)

A. Greatly increase risk (cost and schedule).
B. Improve the ability to deliver a successful project under cost and schedule.
C. Adversely affect the technical development by reducing the level of Systems Engineering effort.
D. Satisfy the requirements for an agile system development cycle with changing requirements and schedule constraints.

The correct answers, "A" and "C", come from section 3.1 in the INCOSE Systems Engineering Handbook version 4. As with the previous question, however, further examination of the groups that passed and failed this question pointed to it being especially challenging for non-native English speakers. The success rate for native English speakers was over 90%, while the success for non-native-English-speakers was less than 50%. That is an undesirable outcome for the exam, so this question was also removed from the test bank.

The final reason a question may be removed from the test bank is if its reference is found to be no longer valid. This is similar to the distinction between validation and verification of a system. The INCOSE Certification Program requires that all exam items be traceable to content in the current version of the Systems Engineering Handbook. As the handbook changes, including from draft version to final printed version, some items may be eliminated from the test bank if they are no longer traceable to the handbook. Similarly, if the "wrong" answers start to look too "right" based on changes in the handbook, those items will be removed from the test bank.

Did the Beta test work? The objectives of the beta tests were multi-fold. The INCOSE Certification Program was able to check that its knowledge exam questions performed as well with real candidates as the subject matter experts thought they would. Over one hundred individuals were able to take the exam at a discount and at a different time and location than they might usually have. 85 candidates passed the exam and are now offered the certification of

Associate Systems Engineering Professional if they complete the necessary administrative tasks. And several INCOSE conferences were able to attract attendees based on the offering of the beta exam.

Future Certification Program Updates

The INCOSE Certification Program has an increasingly diverse set of stakeholders. Some elements of that diversity include the geographic regions from which candidates come and the languages they speak. Diversity also includes the type of systems on which individuals work and their job titles. Stakeholders for the Certification Program are also expanding beyond just the individual applicants to now include their employers, clients, and training providers. This increased complexity of the Program's participants requires increased formality of internal operations and greater integration with the external systems engineering community, both within INCOSE and beyond.

Exam Content. The INCOSE Certification Program will continue to review the information basis for its knowledge exam. The INCOSE Systems Engineering Handbook and related content from ISO 15288 have been the sole data sources for the knowledge exam since 2004. Moving forward, the Systems Engineering Body of Knowledge (SEBoK) will be considered as a source of content for the INCOSE knowledge exam, as will future revisions of the INCOSE Systems Engineering Handbook.

Equivalency Programs In 2014, INCOSE's Certification Program awarded ASEP and CSEP certifications to individuals who had been certified through an alternate process conducted in German rather than through INCOSE's standard process. These were the result of an equivalency agreement where INCOSE evaluated the GfSE Certification Program and recognized it as equivalent to particular levels of INCOSE Certification. INCOSE did not request GfSE grant mutual equivalency. Additional equivalency agreements are currently under evaluation, recognizing that INCOSE's Certification Program requirements may be verified in ways other than the original method.

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Appendix A: Sample Test Questions

The INCOSE Certification Program Office has committed to release sample test questions to help guide applicants and training providers in understanding the format of the INCOSE knowledge exam. The following questions and answers are not planned to be used by the INCOSE Certification Program because of how they performed when tested on candidates in the 2014 beta exams. They are representative of the format and content on the actual exam and can be used by knowledge exam candidates to assist in understanding how the INCOSE exam is structured.

1. How may a system operator use a system to sustain engineering?

A. by reviewing verification analysis
B. by reviewing operator procedures
C. through monitoring system performance data
D. through monitoring the number of trained operators

2. Which two are commonly evaluated as part of the Project Assessment Process? (Choose two.)

A. the network security policy
B. the standards applied to the project
C. the availability of necessary resources
D. the availability of management to the project
E. the compliance with project performance measures

3. What is an example of the wasteful practice of over-processing?

A. Members of a team are split between three physical facilities.
B. The vendor ships four rocket motors to a launch site two years before they are needed.
C. An engineer takes a released interface document and reformats it to match a program she previously worked.
D. A valve is selected by an engineer to meet a deadline and is later determined insufficient, requiring a subsystem redesign.

4. What are two practices an organization can implement when tailoring processes for a specific project? (Choose two.)

A. Assess the effectiveness of the processes
B. Reuse a tailored baseline from another system
C. Start with a standard set of processes and practices
D. Identify separate processes for small and large projects

5. A product baseline has been established for a system under development.

What is the correct means for initiating a permanent change to this baseline?

A. Engineering Notice
B. Deviation and Waiver
C. Request For Proposal
D. Engineering Change Proposal

6. Which step should be conducted in the stakeholder needs and requirements definition process?

A. Document the business case.
B. Perform analysis to develop the operational concept.
C. Use the Markov method to identify the key stakeholders.
D. Document only the needs from the highest equity stakeholders.

7. Which three source documents can be used to provide the basis for the total set of stakeholder requirements? (Choose three.)

A. the parts lists
B. the marketing surveys
C. the vendor data sheets
D. the statements of user objectives
E. the customer needs statements

8. What is the purpose of the Operation Process?

A. Plan for system disposal.
B. Optimize the maintenance process.
C. Ensure the quality of user training.
D. Use the system to deliver its services.

9. What is the purpose of the Transition Process?

A. to transition from the requirements analysis process to the design process
B. to transfer responsibility for the system from one organizational entity to the other
C. as a conversion from the critical engineering design process to the production process
D. as a confirmation that all elements of the system-of-interest perform in accordance with the performance requirements allocated to them

10. What are two examples of waste that lean SE could reduce? (Choose two.)

A. The team members are using outdated software.
B. The connectors are delivered three months after their harness wires.
C. The customer lives in a different part of the country than their suppliers.
D. The manufacturing facility has a box of 100 bolts for a build that requires 25.

11. What are two major types of analyses performed during the Concept stage for defining a System Architecture? (Choose two.)

A. Trade Studies
B. Cost Estimation
C. Risk Mitigations
D. Modeling & Simulation

12. Which Systems Engineering process ends with a formal, written acknowledgement that a system has been properly installed?

A. Transfer process
B. Transition process
C. Verification process
D. Manufacturing process

13. Which two can be used to optimize the number of interfaces for a physical system? (Choose two.)

A. N2 diagram
B. Coupling matrix
C. Verification of aggregates
D. Separation of system elements

14. Measures of effectiveness have been defined for an engineering project.

What is the recommended approach to ensure that the development of the system will satisfy these measures?

A. TPM monitoring
B. Requirement verification
C. Technical risk monitoring
D. Cost and schedule monitoring

15. Which statement is true about Agile Systems Engineering?

A. Agile SE relies on real-time decision-making.
B. The value proposition of Agile SE is risk management.
C. Agile SE and agile-systems engineering are equivalent concepts.
D. Agile systems engineering can be introduced at no extra cost to a program.

16. A customer has provided a stakeholder requirements specification.

What will ensure that developed system requirements align with stakeholder expectations?

A. Early validation
B. Early verification
C. System certification
D. System requirements review

17. In what way are Quality Assurance (QA) and Quality Control (QC) similar?

A. Both occur at the same point in the product life-cycle.
B. Both require audits to establish the independence of the results.
C. Both activities are conducted concurrently for every product test.
D. Both are part of the larger Quality Management activities of an enterprise.

18. Which type of analysis would be used to assess a vehicle's ability to operate in the desert?

A. Cost Analysis
B. Effectiveness Analysis
C. Technical Risk Analysis
D. Mass Properties Analysis

19. What is a final product of the verification process?

A. Requirements allocated to the system elements
B. Verification Plan which defines all verification process results
C. Analysis, test, simulation or observation data for the conclusion reached
D. Interface Control Documents (ICDs) for the interfaces of elements comprising the system

20. Which Technical Management Process ensures that information is properly accessible to those who need it, thereby establishing integrity of relevant system life cycle artifacts?

A. Quality Assurance Process
B. Decision Management Process
C. Information Management Process
D. Configuration Management Process

ANSWERS

Order of Presentation	Correct Answer
1	C
2	CE
3	C
4	AC
5	D
6	B
7	BDE
8	D
9	B
10	BD
11	AD
12	B
13	AB
14	A
15	B
16	A
17	D
18	B
19	C
20	C

Biography

Courtney Wright, CSEP-Acq, is the Program Manager for the INCOSE Certification Program. She has previously worked as a contractor supporting the United States Air Force, National Geospatial-Intelligence Agency, National Aeronautics and Space Administration, and Federal Aviation Administration. Ms. Wright earned her Bachelor's degree in Mechanical Engineering from the University of Virginia and her Master's in Operations Research from Georgia Tech. A small business owner, she also continues to consult as an instructor for professional development courses in systems engineering.