Note:

This paper consists of ONLY multiple choice questions.

All questions are worth 2 marks.

There is negative marking – a ½ mark will be deducted for an incorrect answer.

Instructions:

Enter your answers on the attached multiple choice sheet. Detach the sheet and hand it in at the end of the exam. Use your answer book for rough work.

QUESTION 1

Equations

$$Z = \frac{X-\mu}{\sigma}$$

$t = (a + 4m + b)/6$

$v = [(b - a)/6]^2$

The following table contains information about a project. Use it to answer the questions 1.1 – 1.6 below:

	Time estimate (weeks)			Immediate
Activity	a	m	b	Predecessor
A	1	4	7	-
B	2	6	7	A
C	3	4	6	D
D	6	12	14	A
E	3	6	12	D
F	6	8	16	B,C
G	1	5	6	E,F

1.1 The expected time (in weeks) for activity D is

A. 9.8
B. 13.5
C. 11.3
D. 12.4
E. 6.7

1.2 The variance (in weeks) for activity A is

A. 1
B. 0.5
C. 0.7
D. 0.3
E. 1.8

QUESTION 1 CONTINUES OVERLEAF/….
PTO/Page 2…

1.3 The critical path is
- A. ABFG
- B. ADCFG
- C. ADEG
- D. ADEF
- E. ABEG

1.4 The expected time to complete the project is
- A. 23 weeks
- B. 45 weeks
- C. 26.33 weeks
- D. 30.83 weeks
- E. 33 weeks

1.5 The variance on the critical path is
- A. 7.81 weeks
- B. 5.7 weeks
- C. 5.2 weeks
- D. 6.5 weeks
- E. 9.4 weeks

1.6 What is the probability that the project gets completed in 34 weeks?
- A. 65%
- B. 68.70%
- C. 95.70%
- D. 89.60%
- E. 87%

TOTAL: 12 MARKS

QUESTION 2

The following table contains information about a project. Use it to answer questions 2.1 – 2.5 below:

	Immediate	Time (weeks)		Cost	
Activity	Predecessor	Normal	Crash	Normal	Crash
A	-	4	2	R 10 000.00	R 11 000.00
B	A	3	2	R 6 000.00	R 9 000.00
C	A	2	1	R 4 000.00	R 6 000.00
D	B	5	3	R 14 000.00	R 18 000.00
E	B,C	1	1	R 9 000.00	R 9 000.00
F	C	3	2	R 7 000.00	R 8 000.00
G	E,F	4	2	R 13 000.00	R 25 000.00
H	D,E	4	1	R 11 000.00	R 18 000.00
I	H,G	6	5	R 20 000.00	R 29 000.00

QUESTION 2 CONTINUES OVERLEAF/….
PTO/Page 3…

2.1 What is the critical path?
- A. ABDHI
- B. ABEHI
- C. ABEGI
- D. ACEHI
- E. ACEGI

2.2 What is the estimated completion time?
- A. 19 weeks
- B. 17 weeks
- C. 18 weeks
- D. 22 weeks
- E. 20 weeks

2.3 You are required to crash the project by 3 weeks. Which tasks should be shortened?
- A. A by 2 weeks, F by 1 week
- B. A by 1 week, C by 1 week, D by 1 week
- C. A by 2 weeks, D by 1 week
- D. A by 3 weeks
- E. D by weeks

2.4 What is your total crash cost?
- A. R 2 000
- B. R 3 000
- C. R 4 500
- D. R 1 500
- E. R 6 000

2.5 What would be the final total project cost after crashing?
- A. R 94 000
- B. R 100 000
- C. R 133 000
- D. R 97 000
- E. R 96 000

TOTAL: 10 MARKS

QUESTION 3

3.1 Which of the following is NOT considered to be a project resource?
- A. Salaried staff
- B. Hourly workers
- C. Construction equipment and materials
- D. Installed equipment and materials
- E. None of the above

QUESTION 3 CONTINUES OVERLEAF/….
PTO/Page 4…

3.2 Resource levelling is
- A. minimizing the fluctuations in day-to-day resource use at the beginning of the project
- B. attempts to make the daily use of only human resources as uniform as possible
- C. minimizing the fluctuations in day-to-day resource use throughout the project
- D. attempts to make the daily use of only equipment and material as uniform as possible
- E. minimizing the fluctuations in day-to-day resource use towards the end of the project

3.3 The following techniques may be used to level resources
- A. getting certain overloaded resources to work overtime
- B. delaying the start of certain activities
- C. hiring additional resources
- D. fast-tracking and crashing
- E. All of the above

3.4 Project risk
- A. may have one or more causes and, if it occurs, one or more impacts
- B. has a positive or a negative effect on at least one project objective
- C. is uncertainty that matters
- D. is an uncertain event or condition
- E. All of the above

3.5 Which of these statements does not refer to a risk
- A. The contractor may not deliver on time
- B. We may be unable to test until production hardware is used
- C. Extra work may be identified at the detailed design gateway
- D. There is a risk that we will be late
- E. Allocated resources may be assigned to higher priority projects

3.6 Which of the following techniques will ensure that the impact of risk will be reduced?
- A. Risk avoidance
- B. Risk mitigation
- C. Risk contingency planning
- D. Risk transfer
- E. All of the above

QUESTION 3 CONTINUES OVERLEAF/….
PTO/Page 5…

3.7 Which of the following is not an external stakeholder?

A. Support Groups - Legal, Accounting, and Clerical Support
B. External Customers
C. Suppliers (materials)
D. Users and User Groups
E. Contractors & Consultants (labour & services)

TOTAL: 14 MARKS

QUESTION 4

4.1 Systems Engineers

A. must focus on a technical discipline and no other disciplines
B. are only responsible for the design's technical integrity
C. must not interfere in the interpretation and communication of objectives, requirements, system architecture, and design
D. must determine the end game and overall objectives of the endeavor
E. organize and lead multidisciplinary teams

4.2 The "art" of Systems Engineering is

A. ensuring competent technical leadership in a project
B. balancing broad technical domain knowledge
C. engineering instinct and problem solving
D. developing new missions and systems
E. All of the above

4.3 "Know the margins" is NOT about …

A. the difference between requirements and capability
B. making the requirements a little tougher than necessary
C. knowing that all the requirements have been covered in the specifications
D. going beyond and being able to understand and articulate how much margin we have available in any situation
E. meeting requirements, testing effectively, and doing the job correctly, we create a capability

4.4 The common objective of a system is defined by

A. the interaction of the parts
B. some of the parts
C. at least one other part in the system
D. the wider system
E. how the parts are grouped

4.5 Which of the following is NOT a phase of the systems engineering lifecycle

A. Project Planning
B. Concept selection
C. Concept exploration and benefits analysis
D. Concept of operations development
E. None of the above

QUESTION 4 CONTINUES OVERLEAF/….
PTO/Page 6…

4.6 Complex systems design is required when
A. parts are interconnected
B. parts are autonomous
C. parts are changing
D. processes are not linear
E. All of the above

4.7 The research phase of the design process DOES NOT involve
A. Divergent thinking
B. Ideation
C. Understanding the Local context
D. Understanding the system context
E. All of the above

TOTAL: 14 MARKS

QUESTION 5

5.1 According to the International Council on Systems Engineering (INCOSE), what competency constitutes the discipline of Systems Engineering?
A. Systems Thinking
B. Systems Design
C. Systems Science
D. Stakeholder Requirements Management
E. Lifecycle Process Definition

5.2 What is a System?
A. A system is a construct or collection of different elements
B. The elements can include people, hardware, software, facilities, policies, and documents
C. Results not obtainable by the elements alone, but through the sum of all the parts
D. All of the above
E. None of the above

5.3 Which statements about emergent properties are INCORRECT?
A. Emergent properties are of the system elements rather than the system as a whole
B. Unforeseen emergent properties are always negative requiring an intervention
C. Emergent properties can be either desired or unforeseen
D. a) and b) above
E. All of the above

QUESTION 5 CONTINUES OVERLEAF/….
PTO/Page 7…

5.4 According to INCOSE's Guide to Writing Good Requirements, which characteristic does NOT apply to requirements statements?

A. Complete
B. Unambiguous
C. Singular
D. Able to be validated
E. Conforming

5.5 According to Peter Senge, which of these characteristics is NOT required for Systems Thinking?

A. A willingness to challenge your own mental models
B. An unwaivering and strong commitment to teaching
C. Open to different ways of seeing and doing things
D. Always including multiple viewpoints when looking at something
E. Triangulating multiple perspectives

5.6 Which statement below is NOT associated with Architectural Frameworks?

A. Specify how to organize and present an Enterprise Architecture
B. Manages complexity by defining a standard set viewpoints
C. Provides a common basis for understanding and communicating how systems are structured to meet strategic objectives
D. Famous architectural frameworks include the Zachman framework, TOGAF, DoDAF and MODAF
E. The many viewpoints must be consistent

5.7 Which basic skill or behaviour is not associated with Systems Thinking?

A. Abstract thinking
B. Know when to stop
C. Teamwork
D. Performance management
E. Problem solving

5.8 Which "Hat" is NOT contained within De Bono's Six Thinking Hats associated with Systems Thinking?

A. Black Hat - Safety hat; focus on risks and problems
B. Green Hat - Creative thinking hat; focus clarity and big picture
C. Red Hat - Feelings hat; focus on intuition and gut instinct
D. White Hat - Information hat; focus on facts
E. Blue Hat - Control hat; focus on managing thinking

5.9 What is the purpose of a Systems Definition?

A. Develop an understanding of the System-of-Interest within its Containing System
B. Develop an understanding of the System-of-Interest and its Sub-Systems
C. Develop an understanding of the System-of-Interest and its Sibling Systems
D. All of the above
E. None of the above

QUESTION 5 CONTINUES OVERLEAF/….
PTO/Page 8…

5.10 Which of these sources would provide reference information related to Systems Engineering?

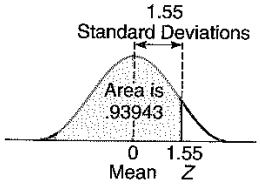
A. International Standard ISO/IEC 15388
B. INCOSE Systems Engineering Body of Knowledge (SEBOK)
C. INCOSE Systems.X Handbook, 4th Edition
D. The Sixth Discipline, The Art & Practice of the Learning Organisation, Peter Senge
E. INCOSE Building Knowledge & Curriculum to Adhere to Systems Engineering Practices (BKCASEP)

TOTAL: 20 MARKS

----------END----------

TABLES

APPENDIX I NORMAL CURVE AREAS



To find the area under the normal curve, you can apply either Table I.1 or Table I.2. In Table I.1, you must know how many standard deviations that point is to the right of the mean. Then, the area under the normal curve can be read directly from the normal table. For example, the total area under the normal curve for a point that is 1.55 standard deviations to the right of the mean is .93943.

TABLE I.1

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.50000	.50399	.50798	.51197	.51595	.51994	.52392	.52790	.53188	.53586
.1	.53983	.54380	.54776	.55172	.55567	.55962	.56356	.56749	.57142	.57535
.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.61409
.3	.61791	.62172	.62552	.62930	.63307	.63683	.64058	.64431	.64803	.65173
.4	.65542	.65910	.66276	.66640	.67003	.67364	.67724	.68082	.68439	.68793
.5	.69146	.69497	.69847	.70194	.70540	.70884	.71226	.71566	.71904	.72240
.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.75490
.7	.75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.78524
.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.81327
.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.83891
1.0	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.86214
1.1	.86433	.86650	.86864	.87076	.87286	.87493	.87698	.87900	.88100	.88298
1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.90147
1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.91774
1.4	.91924	.92073	.92220	.92364	.92507	.92647	.92785	.92922	.93056	.93189
1.5	.93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.94408
1.6	.94520	.94630	.94738	.94845	.94950	.95053	.95154	.95254	.95352	.95449
1.7	.95543	.95637	.95728	.95818	.95907	.95994	.96080	.96164	.96246	.96327
1.8	.96407	.96485	.96562	.96638	.96712	.96784	.96856	.96926	.96995	.97062
1.9	.97128	.97193	.97257	.97320	.97381	.97441	.97500	.97558	.97615	.97670
2.0	.97725	.97784	.97831	.97882	.97932	.97982	.98030	.98077	.98124	.98169
2.1	.98214	.98257	.98300	.98341	.98382	.98422	.98461	.98500	.98537	.98574
2.2	.98610	.98645	.98679	.98713	.98745	.98778	.98809	.98840	.98870	.98899
2.3	.98928	.98956	.98983	.99010	.99036	.99061	.99086	.99111	.99134	.99158
2.4	.99180	.99202	.99224	.99245	.99266	.99286	.99305	.99324	.99343	.99361
2.5	.99379	.99396	.99413	.99430	.99446	.99461	.99477	.99492	.99506	.99520
2.6	.99534	.99547	.99560	.99573	.99585	.99598	.99609	.99621	.99632	.99643
2.7	.99653	.99664	.99674	.99683	.99693	.99702	.99711	.99720	.99728	.99736
2.8	.99744	.99752	.99760	.99767	.99774	.99781	.99788	.99795	.99801	.99807
2.9	.99813	.99819	.99825	.99831	.99836	.99841	.99846	.99851	.99856	.99861
3.0	.99865	.99869	.99874	.99878	.99882	.99886	.99899	.99893	.99896	.99900
3.1	.99903	.99906	.99910	.99913	.99916	.99918	.99921	.99924	.99926	.99929
3.2	.99931	.99934	.99936	.99938	.99940	.99942	.99944	.99946	.99948	.99950
3.3	.99952	.99953	.99955	.99957	.99958	.99960	.99961	.99962	.99964	.99965
3.4	.99966	.99968	.99969	.99970	.99971	.99972	.99973	.99974	.99975	.99976
3.5	.99977	.99978	.99978	.99979	.99980	.99981	.99981	.99982	.99983	.99983
3.6	.99984	.99985	.99985	.99986	.99986	.99987	.99987	.99988	.99988	.99989
3.7	.99989	.99990	.99990	.99990	.99991	.99991	.99992	.99992	.99992	.99992
3.8	.99993	.99993	.99993	.99994	.99994	.99994	.99994	.99995	.99995	.99995
3.9	.99995	.99995	.99996	.99996	.99996	.99996	.99996	.99996	.99997	.99997

MULTIPLE CHOICE ANSWER SHEET

Detach and handin.

Student Number: _____

Question No.	Answer	Mark	Question No.	Answer	Mark
1.1			4.1		
1.2			4.2		
1.3			4.3		
1.4			4.4		
1.5			4.5		
1.6			4.6		
			4.7		
2.1					
2.2			5.1		
2.3			5.2		
2.4			5.3		
2.5			5.4		
			5.5		
			5.6		
3.1			5.7		
3.2			5.8		
3.3			5.9		
3.4			5.10		
3.5					
3.6					
3.7					
			TOTAL MARK	**/70**	
				%	