Note:

This paper consists of ONLY multiple choice questions.

There is no negative marking

Instructions:

Enter your answers on the attached multiple choice sheet.

Detach the sheet and place it inside your answer book.

Use your answer book for rough work.

QUESTION 1 (Project Management – Ms Sunjka)

Equations

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

$t = (a + 4m + b)/6$ $v = [(b - a)/6]^2$

1.1 For an activity in a Single Time Estimate CPM analysis, the Early Finish time is 8 and the Late Finish time is 10. Which of the following statements is true?

A. The Late Finish is 12
B. The Early Finish is 10
C. The slack for this activity is 2
D. The duration of this activity is 2
E. The activity is on the critical path (2)

1.2 For an activity in a Single Time Estimate CPM analysis the Early Finish time is 20 and the Late Finish time is 20. Which of the following statements is true?

A. The activity's late start must happen before its early start
B. The activity is on the critical path
C. The slack for this activity is 20
D. The duration of this task is zero
E. The duration of this task is 20 (2)

1.3 A listing of immediate predecessor activities is important information in a single time estimate CPM analysis for which of the following reasons?

A. It specifies the relationships in the CPM network of activities
B. It provides useful timing information
C. It includes cost information
D. It is the probability information required in the final step of CPM
E. None of the above (2)

1.4 If you have an optimistic time of 4 weeks, a most likely time of 6 weeks, and a pessimistic time of 8 weeks on an activity in a CPM managed project, what is the expected time for this activity?

QUESTION 1 CONTINUES OVERLEAF/….

PTO/Page 2…

A. 4 weeks
B. 5 weeks
C. 6 weeks
D. 7 weeks
E. 8 weeks (1)

1.5 If you have an optimistic time of 4 weeks, a most likely time of 6 weeks, and a pessimistic time of 14 weeks on an activity in a CPM managed project, what is the expected time for this activity?
A. 4 weeks
B. 5 weeks
C. 6 weeks
D. 7 weeks
E. 8 weeks (1)

1.6 A company wants to use CPM analysis to manage their project. One of the activities that make up the project has a highly variable time period. Three estimates have been given to determine this activity time. The values are optimistically 1 hour, a most likely time of 5 hours, and a pessimistic time of 6 hours. Using the three activity time estimation procedure for CPM, what is the expected time for this activity?
A. 2.5 hours
B. 3.5 hours
C. 4.5 hours
D. 5.5 hours
E. None of the above (1)

1.7 If the pessimistic duration of an activity is 10 and the optimistic duration is 4, what is the variance for the activity time when using CPM analysis?
A. 1
B. 2.333
C. 4.777
D. 10.4
E. 12 (2)

1.8 You have determined the critical path in a CPM analysis. You would like to determine the probability of completing the project is a desired period of time. One of the activities on the critical path has an optimistic time of 5 minutes, a most likely time of 6, and a pessimistic time of 17. What is the variance estimate of this activity?
A. 0.5
B. 1
C. 2
D. 3
E. 4 (1)

QUESTION 1 CONTINUES OVERLEAF/….

PTO/Page 3…

1.9 You have just computed a Z=2.55 in a CPM analysis of a critical path for a project. Based on this Z value what is the probability of completing this project on time?

A. 0.76543
B. 0.67543
C. 0.99061
D. 0.99461
E. You cannot tell based on the information given (1)

1.10 Below are the data for a Time-Cost CPM Scheduling analysis. The time is in days and the costs include both direct and indirect costs.

	Immediate	Normal	Crash	Normal	Crash
Activity	Predecessor	Time	Time	Cost	Cost
A	None	3	2	$200	$400
B	A	4	3	$300	$600
C	A	1	1	$300	$300
D	B and C	3	2	$500	$550
E	D	2	1	$500	$900

If you crash this project to reduce the total time by four days, what is the total time of the project and total cost?

A. Total time is 10 days, total cost is $2500
B. Total time is 9 days, total cost is $2300
C. Total time is 8 days, total cost is $2750
D. Total time is 8 days, total cost is $1850
E. Total time is 9 days, total cost is $2350 (3)

1.11 You have collected the data for a Time-Cost CPM Scheduling model analysis. The time is in days and the project "direct costs" are given below.

	Immediate	Normal	Crash	Normal	Crash
Activity	Predecessor	Time	Time	Cost (Direct)	Cost (Direct)
A	None	3	2	$300	$400
B	A	3	3	$100	$100
C	A	1	1	$200	$200
D	B and C	3	2	$400	$550
E	D	2	1	$500	$900
F	E	3	3	$200	$200
G	F	2	2	$100	$100

The indirect costs for the project are determined on a daily duration basis. If the project lasts 16 days the total indirect costs are $400, 15 days they will be $250, 14 days they will be $200, and 13 days they will be $100. If you crash this project by one day what is the total (i.e., direct and indirect) project cost?

QUESTION 1 CONTINUES OVERLEAF/….

PTO/Page 4…

A. $2150
B. $2300
C. $2400
D. $2450
E. $2500 (4)

TOTAL: 20 MARKS

QUESTION 2 (Systems Engineering – Mr Cloete-Hopkins)

2.1 What is a System?
A. A construct or collection of elements.
B. Results not obtainable by the elements alone, but through the sum of all the parts.
C. The parts can include people, hardware, software, facilities, policies, and documents.
D. All of the above.
E. None of the above. (1)

2.2 Which statement about emergent properties is INCORRECT?
A. Emergent properties are of the system as a whole, rather than of any of the system elements.
B. Emergent properties can be desired or unforeseen.
C. Unforeseen emergent properties are always negative requiring an intervention.
D. All of the above
E. None of the above (1)

2.3 What is the purpose of a Systems Definition?
A. Develop an understanding of the System-of-Interest only
B. Develop an understanding of the System-of-Interest within its Containing System only
C. Develop an understanding of the System-of-Interest and its Sub-Systems only
D. Develop an understanding of the System-of-Interest (including its Sub-Systems) and its Sibling Systems only
E. Develop an understanding of the entire systems hierarchy including interactions with other external systems and/or containing systems

(1)

2.4 Following an occurrence (e.g. accident or incident), which of the following common causes of failure would NOT be assessed in determining ‘what went wrong’?
A. Component failure; including component design fault
B. System design; including complex interactions
C. Environmental stress; including temperature
D. Human behaviour; including human factors
E. All of the above (1)

QUESTION 2 CONTINUES OVERLEAF/….
PTO/Page 5…

2.5 Which statement is correct related to Systems Engineering?

A. Systems engineering is all about project/programme management
B. Systems engineering transliterates as wholes creating or synthesising wholes/systems from interacting parts to perform with optimum effectiveness in their operational environment
C. Systems engineering is confined to engineering
D. Systems engineering is a methodical, disciplined approach for the design, realisation and technical management of a system in a project
E. None of the above (1)

2.6 Which statement does NOT describe why we do Systems Engineering?

A. Generation of potential credible system solutions taking account of System of Interest and Containing System
B. Address systems development through the project lifecycle
C. Determine and manage stakeholder viewpoints, concept of operations and translation of needs into requirements to develop a robust system
D. Analyse interfaces and system functionality to develop a solution that meets its key requirements
E. Integration and verification of the system elements taking account of inputs from differing disciplines (1)

2.7 Which basic concepts belong to Systems Engineering?

A. Requirements management
B. Verification and validation
C. Interface management
D. Only A. and B. above
E. All of the above (1)

2.8 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 (1)

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

A. Systems Engineering for Dummies
B. International Standard ISO/IEC 15388
C. INCOSE S-TEAMS Handbook, 4th Edition
D. Building Knowledge & Curriculum to Adhere to Systems Engineering Practices (BKCASEP)
E. All of the above (1)

QUESTION 2 CONTINUES OVERLEAF/….
PTO/Page 6…

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

A. Black Hat - Judgment and caution; logic
B. Purple Hat – Calmness and clarity; process guide
C. Red Hat - Intuition, feelings and emotions
D. Green Hat - Creativity, alternatives, proposals, observations
E. White Hat - Facts, figures, information needs and gaps (1)

TOTAL: 10 MARKS

QUESTION 3 (Systems Engineering – Ms Sunjka)

3.1 Which of these is NOT a personal characteristic of a Systems Engineer?

A. Diverse technical skills
B. Self -confidence and arrogance
C. Comfortable with uncertainty
D. Comfortable with change
E. Ability to make system-wide connections (1)

3.2 "Commission, not omission" means that…

A. A system should be commissioned even when there may be something missing.
B. A systems engineer does not need authority from anyone to investigate anything.
C. The systems engineer's job is the commissioning of a system.
D. You go out, you make decisions. If someone tells you to stop, you should stop.
E. None of the above (1)

3.3 "Appreciate the value of process" does NOT mean…

A. The processes of systems engineering are the tools for the systems engineer
B. A successful systems engineer knows how to balance the art of technical leadership with the science of systems management
C. Systems engineering is about the processes
D. The art of systems engineering is about how the systems engineer manages people and processes
E. It is what the team does with the process and the talents of the team that matters (1)

3.4 "Know the margins" is NOT about …

A. A margin is the difference between requirements and capability
B. One way to add margin is to make the requirements a little tougher than necessary
C. We must go beyond and be able to understand and articulate how much margin we have available in any situation
D. Knowing that all the requirements have been covered in the specifications
E. If we meet requirements, test effectively, and do the job correctly, we create a capability (1)

QUESTION 3 CONTINUES OVERLEAF/….
PTO/Page 7…

3.5 "Proper paranoia" means ….

A. Expecting the best but thinking about and planning for the worst
B. The systems engineer periodically checks and rechecks certain details
C. The systems engineer is continually anxious about the project
D. Is about knowing the requirements and being mostly sure that you have met them
E. None of the above (1)

TOTAL: 5 MARKS

QUESTION 4 (Systems Engineering – Prof Law)

4.1 The systems context DOES NOT need to understand:

A. all the interactions across the physical boundaries
B. all the physical inputs and outputs
C. the System boundary
D. the modelling boundary
E. None of the above (1)

4.2 Common architectures are:

A. Logical architecture
B. Functional architecture
C. Physical architecture
D. interfacing physical components
E. All of the above (1)

4.3 Configuration Items are NOT:

A. any artefacts which are baselined
B. where changes are very tightly controlled
C. building blocks that make up the system
D. they should not be qualified and/or integrated
E. they should be clearly defined and developed (1)

4.4 Detailed Design steps DO NOT include:

A. performing an architectural breakdown
B. developing a functional architecture
C. developing the software flow diagram
D. allocating functions to Hardware Configuration Items
E. all boundary crossing aspects (1)

4.5 Design the functional solution DOES NOT involve:

A. revisiting the original functional flow block diagram
B. decomposing the system requirements to functional requirements
C. augmenting the functional detail
D. identifying item (physical, data, energy) flows between functions and sub functions
E. identifying control flows between functions and sub functions (1)

TOTAL: 5 MARKS

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

QUESTION 5 (Systems Engineering –Mr Mabelo)

5.1 Large Infrastructure Projects are increasingly suffering from:

A. Schedule Overruns
B. Costs Overruns
C. Long commissioning time
D. Failure to meet the requirements or satisfy the needs of the client
E. All of the above (1)

5.2 What determines "complexity" in a (large infrastructure)?

A. the number of parts or activities
B. the degree of differentiation between the parts
C. the structure and strength of their connections
D. None of the above
E. All of the above (1)

5.3 Which of these statements is FALSE?

A. Requirements Management is the key "space" where Project Management (PM) meets Systems Engineering (SE)
B. Project Management is "… the application of knowledge, skills, tools, and techniques to project activities in order to meet project requirements" – which evidently falls in the realm of Systems Engineering ...
C. Project requirements end only when the users/stakeholders have had some input
D. SE treats the requirements of the complete lifecycle as core elements; so a specific step is built-in at each phase to clearly review whether the requirements were met
E. All of the above (1)

5.4 Approaches to Project Success DO NOT include:

A. A more comprehensive Project Lifecycle Model – which includes the operational environment, thus aligning to Systems Engineering
B. The traditional focus on Execution Phase, be it on basis of value or costs
C. Various Project Lifecycle activities are executed along three essential "tracks" such as: (1) Business Stream, (2) Technical Stream and (3) Integration Stream
D. The structural integration of the Verification and Validation (V&V) of design proposals
E. Risk Management starts early in the project, by identifying the full range of interacting threats and opportunities (1)

5.5 Benefits of Applying Systems Engineering DO NOT include:

A. Reducing average cost and schedule overruns
B. Reduces the variances in average cost
C. Meeting project requirements
D. Increasing variances in schedule overruns
E. Ensures well-planned responses to correct problems as they occur (1)

TOTAL: 5 MARKS

QUESTION 6 CONTINUES OVERLEAF/….
PTO/Page 9…

QUESTION 6 (Systems Engineering – Prof Siriram)

6.1 In Systems thinking it is important:

A. The HAS (human activity systems) is applied early on the process, it is an interactive process involving people in the system.
B. That it is based on facts; and perceptions are not important.
C. That the problem or opportunity is clearly defined.
D. That the problem owner's pre-conceived ideas of the proposed solution are met.
E. All of the above (1)

6.2 Systems requirements

A. Is done only at the beginning of the project.
B. Can be applied to buying a house.
C. Must be applied to all projects.
D. Must be recorded on all projects by the Systems Engineer down to the component level.
E. None of the above (1)

6.3 To reduce risks

A. Build in and maintain options as long as possible.
B. Complete the easy parts first.
C. Stay away from scheduling a series of intermediate goals to be reached by precursor or partial configurations as this will cause additional cost and impact project delivery.
D. Stay away from newer technologies in high risk projects.
E. All of the above (1)

6.4 In a social systems thinking mode.

A. The performance of the whole is not the sum of the performance of the parts.
B. In a system problem the performance of the whole is derived from the characteristics of its parts.
C. A system can be solved by focusing on individual parts.
D. We can always count that the parts will perform as they are expected to.
E. All of the above (1)

6.5 In Systems Thinking.

A. People and groups are purposive have their own interests, intentions, and generate their own goals.
B. A key characteristic of the players is that they do not exhibit choices.
C. Goals are always shared by the players in the system.
D. People and groups are purposeful have their own interests, intentions, and generate their own goals.
E. All of the above (1)

QUESTION 6 CONTINUES OVERLEAF/….
PTO/Page 10…

6.6 In systems thinking.

A. Different methods are required to diagnose, describe and understand a system problem.
B. Standard methods are required to diagnose, describe and understand a system problem.
C. A rich body of knowledge on how systems thinking should be applied and the methods are tried and tested.
D. A paradigm shift in thinking is not required to go from an AS-IS situation to a TO-BE situation.
E. All of the above (1)

6.7 Many organisations have not implemented systems thinking because.

A. They are unsure of the results.
B. They have tried systems thinking approaches and have not achieved the desired results.
C. They are unaware of systems thinking and systems thinking practitioners and researchers have not done a good job in creating awareness around systems thinking.
D. It is the same as the other concepts in process engineering, innovation and other management philosophies, systems thinking is a buzz word.
E. None of the above (1)

6.8 Characteristics of large complex systems include:

A. The system is statistic over time.
B. Sub-systems are purposive and generate their own goals.
C. The system is largely closed to the external environment.
D. The system is largely open to the external environment.
E. All of the above (1)

6.9 In systems thinking the focus is on

A. Relationships rather than parts.
B. Events and not patterns.
C. Less circular causality.
D. More solutions rather than the path or approach to defining the solution.

(1)

6.10 Organisations are:

A. Closed systems and statistic.
B. Open systems, dynamic, connected and exhibit purposeful behaviour.
C. Open systems, dynamic, connected and exhibit purposive behaviour.
D. Not self-organising and boundaries are not easily crossed.
E. None of the above (1)

TOTAL: 10 MARKS

QUESTION 7 CONTINUES OVERLEAF/….
PTO/Page 11…

QUESTION 7 (Systems Engineering –Mr Mudavanhu)

Use the description below to answer question 7.1 and 7.2

Prior to World War II the world was dominated by the thinking that to better understand a problem one had to reduce, decompose or disassemble it to simple indivisible parts to get a clearer explanation regardless of size and complexity. This approach had its advantages which included better description and knowing things work by focusing on the structure and separate analysis of parts.

7.1 Which of the following terms does not best describe this approach?

A. Reductionist
B. Machine age
C. Interpretive approach
D. Mechanistic thinking
E. None of the above (1)

7.2 As the world approached the 21st century, the approach described in the brief above encountered several challenges. Which of the following statements describe challenges encountered?

A. Failure to cope with complexity - human-made or technical systems became so complex that even the designers failed to totally understand them
B. Failure to explain the property of emergence at different hierarchies in some systems, processes etcetera
C. Dependence on the original developers (designers), as solutions were based on detailed component equations
D. All of the above statements
E. None of the above statements (1)

7.3 Which of the following terms does not best define a system?

A. A holistic interdisciplinary framework to drive processes that enable sustainable whole solutions to be generated throughout a system life cycle
B. A group of components that work together for a specified purpose
C. A set of elements connected together which forms a whole, this showing the properties of the whole rather than properties of its component parts
D. A combination of interacting elements organised to achieve one or more stated purposes
E. None of the above (1)

Use the description below to answer question 7.4, 7.5 and 7.6

Pioneering work on systems classification is owed to Kenneth Boulding, who attempted coherent classification of all systems in the world from a meta-level (Hitchin, 2007:11). One of the system classes comprises of … 'conceptual man-made systems designed for a purpose, which include ideas, plans, frameworks and blueprints' These systems have also been sub-classified as static or dynamic or open or closed (Fabrycky & Blanchard, 2006) depending on structure of the system and an interaction it has with the environment respectively.

QUESTION 7 CONTINUES OVERLEAF/….
PTO/Page 12…

It is important to note that within these main system classes presented above, the systems behaviour changes depending on where the system is in existence, that is, their context. This leads to the following systems scale types; a) Ordinary Systems (OS) b) System of Systems (SoS); c) Complex Systems (CxS); and d) Complex Adaptive Systems (CAS)

7.4 Which system class or classification is being referred to above?

A. Designed Physical System
B. Designed Abstract System
C. Social Technological System
D. Complex System
E. None of the above (1)

7.5 Which of the following can be best described by the following brief?

"…These have a system integrator (Sheard, 2011). Examples include windows operating system, a military mission, the justice system, a university among many known such systems. These however are not, in principle, described as self-organising nor do they contain many autonomous agents who self-organize in a co-evolutionary way to optimise their separate values.

A. Ordinary System
B. System of System
C. Natural Systems
D. Complex Adaptive System
E. None of the above (1)

7.6 Which of the following best describes a complex system?

A. Complex systems include aspects of simpler systems
B. Complex systems are dynamic and they self-organise
C. Complex systems have the property of emergence in nature
D. All of the above
E. None of the above (1)

7.7 The systems engineering spectrum has two extremes, the 'soft' and the 'hard, side, hence the terms Soft System and Hard Systems respectively. Real world problems, however, present themselves in different proportions of the two sides. Which of the following terms is NOT aligned to the 'Soft' Systems Methodologies?

A. Procedures
B. Perceptions
C. Interests
D. People
E. None of the above (1)

7.8 The SSM was developed by Checkland and his colleagues at Lancaster University (UK) in the 1970s. It was a response to the challenges in applying the 'hard' systems thinking (as applied in high tech engineering projects) to business/ management problems (as prevalent in social technological systems alike). Based on this background and your knowledge of systems engineering approaches, which of these is not considered a limitation of 'hard' systems methodologies?

A. The enquiry methodology was itself limiting as it ignored practical concerns like perceptions
B. Tackling real world problems in which an objective or a specific end-to-be achieved was a big challenge
C. Emphasis on the top down decomposition of a system into subsystems in order to move fast towards a known desired state
D. It was difficult to get some 'what's' and 'how's' of certain organisational problems
E. All of the above (1)

7.9 Which of the following choice best describes the assumption/s of Soft Systems Methodologies (SSM's)
A. A more sustainable outcome is learning and better understanding
B. Human factors are important in addressing problems
C. Every situation in real world systems involves humans that are trying to take purposeful action which is meaningful to them
D. All of the above
E. None of the above (1)

7.10 The 'Hard' Systems Methodologies (HSM's) assumes all of the following except;
A. A well-defined problem to be solved
B. A problem is simplified by reducing it
C. The background and history of the problem is always useful
D. People share values and beliefs and consensus can easily be reached
E. None of the above (1)

Use the description below to answer question 7.11 to 7.15.

It is important to note that Checkland's SSM is more of a learning and meaning development tool rather than a solution generator, (Hitchins, 2007; Checkland, 1999). The classic SSM enquiry has several stages. The key point to note is that the problem is analysed from two perspectives;
1) The Real World (what is actually happening in the situation being analysed)
2) The Ideal World (the models of the best possible – driven by logic and systems thinking).

7.11 How many stages does the classical | original Checkland's soft systems methodology have?
A. 8
B. 7
C. 6
D. 5
E. 4 (1)

7.12 Stage 1 of the Checkland's SSM involves finding out what the issues are. This is normally done by those involved in or affected by the problem situation. Lester, (2008) warns that, "care should be taken not to formulate the issue as a problem to be solved, as this can lead to too narrow an approach at too early a stage".

QUESTION 7 CONTINUES OVERLEAF/….
PTO/Page 14…

This is consistent with the systems approach which seeks not to be reductionist. Based on this brief and your knowledge of the methodology, which of the following is the least likely tool to be used for this stage?

A. Naïve picture systems map
B. Interviews
C. Rich picture
D. Systems Hierarchy
E. None of the above (1)

7.13 The advantage of the rich picture is that it draws together information and perspectives from the widest possible range of sources. Checkland, (1981) provides some guidelines as to what should be included and the questions to be answered for the rich picture building process to be considered complete. They are several elements included in an effective rich picture. Which of the following combinations is not an accurate reflection of these elements?

A. Policies and Procedures
B. Context (Climate) and People
C. Issues expressed by people and Structures
D. Structures and Processes
E. None of the above (1)

7.14 Checkland, (1981) developed the mnemonic CATWOE to help ensure the root definition of the relevant systems is complete. The mnemonic - CATWOE essentially represents a structured rigorous definition development process. Which of the following is not necessarily true about the 'W' in the mnemonic?

A. Its represents the world view of the system in question
B. Its represents the Weltanschauung
C. It represents philosophical viewpoints
D. It represents the root definition
E. All of the above (1)

7.15 Of the terms / statements outlined below, which one/s are a correct representation of what systems engineering is all about?

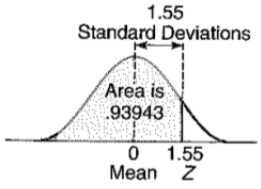
A. Uses a number of frameworks to realise successful systems
B. Holistic approach, all encompassing
C. Interdisciplinary approach, across domains
D. All of the above
E. None of the above (1)

TOTAL: 15 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 (page 1)

Detach and place inside your answer book.

Student Number: _____

Question No.	Answer	Mark	Question No.	Answer	Mark
1.1			3.1		
1.2			3.2		
1.3			3.3		
1.4			3.4		
1.5			3.5		
1.6					
1.7			4.1		
1.8			4.2		
1.9			4.3		
1.10			4.4		
1.11			4.5		
2.1			5.1		
2.2			5.2		
2.3			5.3		
2.4			5.4		
2.5			5.5		
2.6					
2.7					
2.8					
2.9					
2.10					

MULTIPLE CHOICE ANSWER SHEET (page 2)

Detach and place inside your answer book.

Student Number: _____

Question No.	Answer	Mark
6.1		
6.2		
6.3		
6.4		
6.5		
6.6		
6.7		
6.8		
6.9		
6.10		
7.1		
7.2		
7.3		
7.4		
7.5		
7.6		
7.7		
7.8		
7.9		
7.10		
7.11		
7.12		
7.13		
7.14		
7.15		