BOARD OF STUDIES
NEW SOUTH WALES

2010 HSC Engineering Studies
Marking Guidelines

Section I

Question	Answer
1	A
2	C
3	C
4	A
5	D
6	D
7	B
8	C
9	C
10	B

Section II

Question 11 (a)

Criteria	Marks
• Relates a suitable application in engineering materials to a particular component	2
• Lists a suitable engineering material appropriate to the context of the development in lifts	1

Question 11 (b)

Criteria	Marks
• Outlines roles of an engineer in terms of lift design and safe lift operation	3
• Lists roles OR • Outlines ONE role	2
• Lists safety concerns to be addressed	1

Question 11 (c)

Criteria	Marks
• Outlines the impacts of lift technology on both people (society) and building (the built environment)	3
• Lists TWO impacts of life technology on people and building OR • Outlines ONE impact	2
• Lists one impact of lift technology	1

Question 11 (d)

Criteria	Marks
• Describes a suitable method utilising hydraulics for modern lifts	2
• Lists a feasible method	1

Question 12 (a) (i)

Criteria	Marks
• Calculates the relevant forces correctly OR with minor error	2
• Calculates one relevant force correctly	1

Question 12 (a) (ii)

Criteria	Marks
• Calculates the relevant force correctly OR with minor error	2
• Shows limited understanding of the concepts	1

Question 12 (a) (iii)

Criteria	Marks
• Provides a well-structured explanation with appropriate reasoning	2
• Shows limited understanding of the concepts	1

Question 12 (b) (i)

Criteria	Marks
• Recognises and gives a valid reason for the choice	1

Question 12 (b) (ii)

Criteria	Marks
• Calculates correct answer depending upon which cross-sectional shape used OR with minor error	3
• Uses correct formula but with major calculation mistakes	2
• Substitution into a relevant formula	1

Question 13 (a) (i)

Criteria	Marks
• Correct material identified	1

Question 13 (a) (ii)

Criteria	Marks
• Correct description of process and sequence	3
• Some correct features identified	2
• Provides one aspect of process	1

Question 13 (b) (i)

Criteria	Marks
• Correct response	2
• $W \sin\theta(N)$ or $V_{av}\left(m\ s^{-1}\right)$ used in equation OR • Work (ΔPE) or Time (s/v)	1

Question 13 (b) (ii)

Criteria	Marks
• Correct response	2
• Correct substitution for P and V with error	1

Question 13 (b) (iii)

Criteria	Marks
• Correct response	2
• Correct substitution with one error	1

Question 14 (a) (i)

Criteria	Marks
• States correct advantages	2
• States correct advantage	1

Question 14 (a) (ii)

Criteria	Marks
• Correct response	2
• ONE correct substitution into an appropriate formula OR concept of summing two appropriate forces	1

Question 14 (b) (i)

Criteria	Marks
• Correct answer calculated OR with minor error	2
• ONE correct substitution into an appropriate formula	1

Question 14 (b) (ii)

Criteria	Marks
• Selects a suitable material and gives relevant reasons	2
• Names ONE correct material OR gives one relevant reason	1

Question 14 (c)

Criteria	Marks
• Names and describes suitable test	2
• States one correct test OR describes a suitable test without name OR correct description and name of an inappropriate test	1

Question 15 (a)

Criteria	Marks
• Describes, giving general reasons, why the internal combustion engine is preferred	2
• Lists a reason	1

Question 15 (b)

Criteria	Marks
• Explains clearly the operation of air brakes and effect on air flow	2
• Limited understanding of the operation of air brakes not connected with landing	1

Question 15 (c)

Criteria	Marks
• Compares use of composites using at least TWO factors	2
• Limited understanding of the use of composites compared to traditional materials	1

Question 15 (d)

Criteria	Marks
• Shows clear understanding of how the mechanical properties would be affected	2
• Shows limited understanding of how the mechanical properties would be affected	1

Question 15 (e)

Criteria	Marks
• Explains the advantage of Alclad	2
• Lists an advantage	1

Question 15 (f)

Criteria	Marks
• Provides correct assembly AND proportion of components with correct standards, or only minor errors	5
• Provides correct assembly AND proportion of components with some errors	4
• Provides correct assembly AND proportion of components with significant errors	3
• Provides basic assembly AND proportion of components	2
• Provides limited assembly AND proportion of components	1

Question 16 (a) (i)

Criteria	Marks
• Recognises and names correct medium used in the microwave link	1

Question 16 (a) (ii)

Criteria	Marks
• Indicates characteristics of a microwave communication link	2
• Lists one main characteristic of a microwave communication link	1

Question 16 (a) (iii)

Criteria	Marks
• Identifies the correct frequency	1

Question 16 (b) (i)

Criteria	Marks
• Provides characteristics and features of the sampling process consisting of a series of measurements taken at regular instants in time	2
• Indicates a series of measurements OR • Indicates a measurement at some instant of time	1

Question 16 (b) (ii)

Criteria	Marks
• Provides characteristics and features of the quantisation process	2
• States that quantisation is applying a measurement OR • States that quantisation has discrete values	1

Question 16 (b) (iii)

Criteria	Marks
• Correctly identifies the quantisation level at most sampling instants	2
• Correctly applies the concepts of quantisation	1

Question 16 (c)

Criteria	Marks
• Provides a pictorial drawing in proportion AND correct shape	5
• Provides a substantially correct pictorial drawing, mostly complete	4
• Provides a pictorial drawing with several aspects correct	3
• Provides a pictorial drawing with a few aspects correct	2
• Provides a limited AND/OR incomplete pictorial sketch	1

Section III

Question 17 (a) (i)

Criteria	Marks
• Identifies significant criteria that relate to the best selection	2
• Lists a criterion	1

Question 17 (a) (ii)

Criteria	Marks
• Compares TWO or more properties of timber and reinforced concrete poles	2
• Compares ONE property OR identifies properties without comparison	1

Question 17 (a) (iii)

Criteria	Marks
• Identifies ONE social AND ONE environmental impact	2
• Identifies ONE social OR ONE environmental impact	1

Question 17 (b) (i)

Criteria	Marks
• Explains differences in content of reports for TWO different stakeholders	2
• Explains differences in reports without specifying stakeholders	1

Question 17 (b) (ii)

Criteria	Marks
• Correctly explains the reduction in power loss by reducing current	2
• Only states that power loss is reduced without giving reason	1

Question 18 (a) (i)

Criteria	Marks
• Considers a range of appropriate factors	2
• Lists ONE factor correctly	1

Question 18 (a) (ii)

Criteria	Marks
• Names and justifies TWO suitable materials	3
• Names and justifies ONE suitable material OR • Names TWO suitable materials	2
• Names ONE suitable material	1

Question 18 (a) (iii)

Criteria	Marks
• Calculates value correctly	1

Question 18 (b) (i)

Criteria	Marks
• Explains effect correctly referring to rotor current and back emf	2
• Explains some effect based on rotor current OR back emf	1

Question 18 (b) (ii)

Criteria	Marks
• Calculates back emf correctly	2
• Makes simple error in calculation OR • Calculates the voltage drop	1

Engineering Studies

2010 HSC Examination Mapping Grid

Question	Marks	Content	Syllabus outcomes
Section I			
1	1	Civil structures – engineering mechanics and hydraulics: stress and strain - stress/strain diagram	H1.2, H2.1
2	1	Civil structures – engineering mechanics and hydraulics: stress and strain - stress/strain diagram	H1.2, H2.1
3	1	Lifting devices – engineering materials: structure/property relationships in forming processes - forging	H1.2, H2.1
4	1	Personal and public transport – engineering materials: polymers - structure/property relationships and applications	H1.1
5	1	Civil structures – engineering materials: composites - concrete (reinforced and pre-stressed)	H1.2, H2.1
6	1	Personal and public transport – engineering mechanics and hydraulics: static friction - concept of friction and its use in engineering	H2.1, H3.1
7	1	Personal and public transport – engineering electricity electronics: control technology - digital technology	H3.1, H6.1
8	1	Personal and public transport – engineering mechanics and hydraulics: stress and strain - shear stress	H3.1
9	1	Personal peers and public transport – engineering electricity electronics: AC/DC circuits	H3.1, H6.1
10	1	Lifting devices – engineering mechanics and hydraulics: fluid mechanics - hydrostatic pressure	H3.1
Section II **Question 11 — Historical and Societal Influences, and the Scope of the Profession**			
11 (a)	2	Historical and societal influences: engineering innovation	H4.2
11 (b)	3	Scope of the profession: nature and range of work done	H1.1
11 (c)	3	Historical and societal influences: impact of civil structures on society and the environment	H2.2, H4.3
11 (d)	2	Lifting devices – engineering mechanics and hydraulics	H6.1, H6.1, H6.2
Section II **Question 12 — Civil Structures**			
12 (a) (i)	2	Engineering mechanics and hydraulics – truss analysis	H3.1, H6.1, H6.2

Question	Marks	Content	Syllabus outcomes
12 (a) (ii)	2	Engineering mechanics and hydraulics – truss analysis	H3.1, H3.3, H6.1, H6.2
12 (a) (iii)	2	Engineering mechanics and hydraulics – truss analysis: solve problems related to the design of civil structures	H6.1
12 (b) (i)	1	Engineering mechanics and hydraulics – bending stress	H6.1
12 (b) (ii)	3	Engineering mechanics and hydraulics – bending stress: bending stress calculation	H3.1
Section II **Question 13 — Personal and Public Transport**			
13 (a) (i)	1	Engineering materials – choice of non-ferrous material	H1.2, H2.1
13 (a) (ii)	3	Engineering materials – choice of non-ferrous processes	H1.2, H2.1
13 (b) (i)	2	Engineering mechanics and hydraulics – energy/power: mathematical methods to solve engineering problems related to transport	H3.1, H6.1, H6.2
13 (b) (ii)	2	Engineering mechanics and hydraulics – energy/power: mathematical methods to solve engineering problems related to transport	H3.1, H6.1, H6.2
13 (b) (iii)	2	Engineering mechanics and hydraulics – energy/power: mathematical methods to solve engineering problems related to transport	H3.1, H6.1, H6.2
Section II **Question 14 — Lifting Devices**			
14 (a) (i)	2	Historical and societal influences – engineering innovation in lifting devices	H4.1, H4.2
14 (a) (ii)	2	Engineering mechanics and hydraulics – use mathematical methods to solve problems related to lifting devices	H3.1, H6.2
14 (b) (i)	2	Engineering mechanics and hydraulics – fluid mechanics: use mathematical methods to solve problems related to lifting devices	H3.1, H6.2
14 (b) (ii)	2	Engineering materials – properties, uses and appropriateness of materials used in lifting devices	H1.2, H2.1
14 (c)	2	Engineering materials – testing of materials used in lifting devices	H2.1
Section II **Question 15 — Aeronautical Engineering**			
15 (a)	2	Engineering mechanics and hydraulics – propulsion systems	H1.1, H4.1
15 (b)	2	Engineering mechanics and hydraulics – forces: lift, drag, weight, thrust	H2.2

Question	Marks	Content	Syllabus outcomes
15 (c)	2	Engineering materials – composites and aluminium and its alloys used in aircraft	H1.2
15 (d)	2	Engineering materials – composites and aluminium and its alloys used in aircraft: heat treatment of applicable alloys	H1.2
15 (e)	2	Engineering materials – corrosion	H1.2, H2.2
15 (f)	5	Communication – pictorial and orthogonal projections: produce orthogonal drawings applying appropriate Australian standards	H3.2
Section II **Question 16 — Telecommunication**			
16 (a) (i)	1	Engineering electricity/electronics – telecommunications: transmission media	H1.2
16 (a) (ii)	2	Engineering electricity/electronics – telecommunications: transmission media - microwave	H1.1, H1.2
16 (a) (iii)	1	Engineering electricity/electronics – telecommunications: transmission media – microwave: distinguish the communication bands in the electromagnetic spectrum	H1.1, H1.2
16 (b) (i)	2	Engineering electricity/electronics – telecommunications: analogue and digital systems	H2.2, H6.2
16 (b) (ii)	2	Engineering electricity/electronics – telecommunications: analogue and digital systems	H6.2
16 (b) (iii)	2	Engineering electricity/electronics – telecommunications: analogue and digital systems	H6.2
16 (c)	5	Communication – freehand and technical drawing, pictorial and dimensioned	H3.2
Section III **Question 17 — Engineering and the Engineering Report**			
17 (a) (i)	2	Civil Structures – engineering materials: examine the properties, uses and appropriateness of materials used in civil structures Engineering Report writing: analysis of an existing engineering application	H1.2, H2.2, H4.1
17 (a) (ii)	2	Civil Structures – engineering materials: timber and concrete (reinforced and prestressed)	H1.2
17 (a) (iii)	2	Civil Structures – historical and societal influences: critically examine the impact of civil structures on society and the environment	H2.2, H4.3
17 (b) (i)	2	Engineering Report writing	H3.2

Question	Marks	Content	Syllabus outcomes
17 (b) (ii)	2	Personal and Public Transport – engineering electricity/electronics: power generation/distribution – electrical energy and power	H3.1, H6.1
Section III **Question 18 — Engineering and the Engineering Report**			
18 (a) (i)	2	Aeronautical Engineering – scope of the profession: describe the nature and range of work done in this profession Engineering report writing – Analysis of an existing engineering application	H1.1, H3.2, H4.1
18 (a) (ii)	3	Aeronautical Engineering – engineering materials: aluminium and its alloys used in aircraft, polymers	H1.2, H2.1
18 (a) (iii)	1	Aeronautical Engineering – engineering mechanics and hydraulics: forces (moments of a force), apply mathematical and graphical methods to solve flight-related problems	H3.1, H6.2
18 (b) (i)	2	Personal and Public Transport – engineering electricity/electronics: electric motors used in transport systems - principles, applications Lifting Devices – engineering electricity/electronics: applications found in appropriate lifting devices – motors, motor control	H2.2
18 (b) (ii)	2	Personal and Public Transport – engineering electricity/electronics: electric motors used in transport systems - principles, applications, AC/DC circuits Lifting Devices – engineering electricity/electronics: applications found in appropriate lifting devices – motors, motor control	H3.1, H6.1, H6.2