Mechanical engineering manager of underground coal mines

CME1 – Mechanical engineering applicable to underground coal mines

Candidate no.: _____

Legislation to be assessed

Unless otherwise stated all references to Act and Regulations are to:

- *Work Health and Safety Act 2011*
- *Work Health and Safety Regulation 2017*
- *Work Health and Safety (Mines and Petroleum Sites) Act 2013*
- *Work Health and Safety (Mines and Petroleum Sites) Regulation 2022*
- *Explosives Act 2003*
- *Explosives Regulation 2013*

Exam details

Region: New South Wales

Venue: Tocal College

Room: North Court

Start date/time: 13 August 2025 08:50:00

End date/time: 13 August 2025 12:00:00

Duration: 10 minutes reading time, 3 hour examination

Instructions to candidates

- Answers are to be written in the allocated spaces within this booklet ONLY
- Answers must be written in pen however, drawings may be completed in pencil
- Answers are to be presented in an engineering manner making full use of diagrams, tables and schematics as appropriate and showing full workings in calculations.
- This booklet is not to be altered in any way, pages are not to be added or removed
- Additional space is provided at the end of the paper. Please label which question the answer relates to.
- All ten (10) questions are to be attempted
- All questions are of equal value – twenty five (25) marks each
- Candidates must pass the essential question, pass at least six (6) of ten (10) questions, and must obtain a minimum of 60% overall.
- **Essential element: Question 6C - you must obtain a minimum of 3 out of 4 or no marks will be awarded for Question 6.**

Marking Sheet

Candidate no.: _____

Question Number		Mark	Available Mark	Marked by *Name*	Summary comments to justify, as necessary
1	A		**1**		
	B		**3**		
	C		**3**		
	D		**3**		
	E		**4**		
	F		**6**		
	G		**5**		
	Subtotal		**25**		Pass / Fail
2	A		**1**		
	B		**1**		
	C		**1**		
	D		**1**		
	E		**3**		
	F		**5**		
	G		**4**		
	H		**3**		
	I		**6**		
	Subtotal		**25**		Pass / Fail
3	Part A		**5**		
	Part B		**20**		
	Subtotal		**25**		Pass / Fail

Question Number		Mark	Available Mark	Marked by *Name*	Summary comments to justify, as necessary
4	A		**6**		
	B		**6**		
	C		**6**		
	D		**6**		
	E		**1**		
	Subtotal		**25**		Pass / Fail
5	A		**10**		
	B		**15**		
	Subtotal		**25**		Pass / Fail
6	A		**5**		
	B		**1**		
	C Essential		**4**		
	D		**5**		
	E		**10**		
	Subtotal		**25**		Pass / Fail
7	A		**1**		
	B		**2**		
	C		**5**		
	D		**3**		
	E		**5**		
	F		**9**		
	Subtotal		**25**		Pass / Fail

8	A		**5**		
	B		**5**		
	C		**5**		
	D		**5**		
	E		**5**		
	Subtotal		**25**		Pass / Fail
9	A		**1**		
	B		**2**		
	C		**3**		
	D		**4**		
	E		**4**		
	F		**6**		
	G		**5**		
	Subtotal		**25**		Pass / Fail
10	A		**2**		
	B		**1**		
	C		**1**		
	D		**6**		
	E		**3**		
	F		**12**		
	Subtotal		**25**		Pass / Fail
PAPER	**TOTAL**		**250**	**%**	*Marks checked by:*

If marking is reviewed under approved processes, then examiner is to record details**:**

Date	**Examiner**	**Questions reviewed**	**Marks changed**	**Details/justification, as necessary**
Eg. 2/8/19	**Andrew Palmer**	**All**	**Q1 – 4 (previously 5)**	**Found one more criteria**

Question 1: Underground diesel mobile plant – MDG 29

Part A

You are the statutory Mechanical Engineer at an underground coal mine with a large fleet of explosion protected diesel mobile plant. The mine is currently preparing for a longwall move and you have been advised there will be diesel particulate testing of the Longwall SEG.
The longwall ventilation circuit has panel intakes in the travel and belt roads, across the face and out the single tailgate return, which has a projected total quantity of 50 m3/s during the longwall move.
The intake ventilation split will see about 20% of ventilation quantity in the belt road due to cross section obstruction by the conveyor, BSL and the outbye regulator.

You have allocated the following diesel mobile plant to the longwall panel for the longwall move:

	Machines allocated	Ventilation quantity (m3/s)		Power (kW)	Engine
		DPF fitted	No DPF		
Transport	3	5.0	6.9	83	MWM 4.10
Standard LHD	2	7.0	14.1	117	Hino J08C
Chock carrier	3	9.1	51.0	153	3126 DITA
Heavy lift LHD	1	9.1	51.0	153	3126 DITA
Dozer	1	6.8	36.2	113	Cat C7.1

A. Based on the table above what is the maximum number of vehicles you can simultaneously have operating in the longwall panel travel road? **(1 mark)**

	/ 1

B. What vehicles would you allocate to be generally operational in the LW face zone and why?
(3 marks)

	/ 3

Part B

MDG 29 – Guideline for the management of diesel engine pollutants in underground environments – April 2008, Section 6.3.2 Procedures for Monitoring Raw Diesel Particulate Emissions

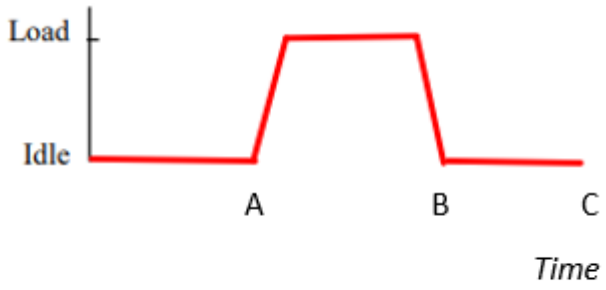

Figure 1 – Diesel particulate load cycle – Standard method

C. Section 6.3.2.1 – Standard method. For Figure 1 above what are the times, including units of time, for A, B and C? **(3 marks)**

	/ 3

D. Section 4.1 Gaseous exhaust emissions. In Table 3 – Raw exhaust gas limits for diesel engines operating in underground environments what are the raw gas ultimate limits for CO and NOx when considering in service engines in underground coal mines? **(3 marks)**

	/ 3

E. In Table 4 - Recommended baseline variances, what is the maximum variation from baseline allowed for CO and NOx? **(4 marks)**

	/ 4

F. Section 3.4.2.2 Main risks. Increase in gaseous and particulate pollutants being generated from the diesel engine will increase people's exposure and increase the risk to the health and safety of people. Gaseous and particulate emissions generated from a Diesel Engine System (DES) may increase due to what factors? Identify six (6) factors. **(6 marks)**

	/ 6

G. Section 3.4.8.3 identifies risk controls to be considered in relation to fuels. Identify five (5) controls you would implement in relation to fuels in terms of risks to health and safety of workers from emissions? **(5 marks)**

	/ 5

Question 2: Lifting and slinging

You are the statutory Mechanical Engineer at a coal mine, and you have been reviewing the site Lifting and Slinging Management Plan in preparation for a planned lift on your ROM stockpile conveyor.

Part A: short answer - Synthetic fibre slings

A. What is the Australian Standard for flat synthetic webbing slings? **(1 mark)**

	/ 1

B. What is the minimum factor of safety for synthetic fibre slings? **(1 mark)**

	/ 1

C. According to Australian Standards what colour would you expect a 2 tonne rated sling to be? **(1 mark)**

	/ 1

D. What is the derating factor for a flat synthetic webbing sling used in a choke lift? **(1 mark)**

	/ 1

E. There are four lifting eye types that can be stitched into the ends of flat synthetic webbing slings. List three (3). **(3 marks)**

	/ 3

Part B: Complex lift planning

You are planning a heavy complex lift to replace a 28 tonne aerial conveyor gantry section of your ROM stockpile feed conveyor requiring two 140 tonne slewing cranes. The gantry is about to be loaded onto a custom semi trailer as an over width and length load (refer photo).
The gantry trestles are approximately 15 metres high, the tripper is securely anchored at the transfer tower out of the way, and the conveyor belt and electrical wiring have been removed. The pins on the existing gantry have been cleaned and treated to aid removal. Two fit for purpose elevated work platforms (EWP) have been introduced to site.

F. Who would you involve in the risk assessment for the replacement of the section of conveyor gantry? List five (5). **(5 marks)**

	/ 5

G. What documents would you prepare, or have prepared, for the lift to remove the existing gantry section? List four (4). **(4 marks)**

	/ 4

H. Who would specifically be involved in the lift for the new gantry section. **(3 marks)**

	/ 3

I. What qualification would you require for each of the personnel involved in the lift? Identify six (6). **(6 marks)**

	/ 6

Question 3: Multiple choice and short answer - Conveyors

Part A: Multiple Choice – identify the most appropriate answer(s).

No marks awarded for an individual question if any incorrect answer is given **(5 marks)**

A. Which Australian Standard would you consult for guarding requirements along a conveyor system:
   i. AS1418
   ii. AS3584.3
   iii. AS1657
   iv. AS4024.3610

B. Your longwall panel conveyor loop take up (LTU) has six (6) falls of belt, and the electro hydraulic winch to tension the LTU has three (3) falls of rope. The tension in the winch rope is:
   i. Half the tension in the belt
   ii. The same as the tension in the belt
   iii. Twice the tension in the belt
   iv. Three times the tension in the belt

C. Belt tension when passing around a driven pulley:
   i. Does not exist
   ii. Decreases
   iii. Stays the same
   iv. Increases

D. In which of the following locations around your development panel conveyor loop take up would you most likely place belt wander switches:
   i. Carry belt inbye the loop take up
   ii. Carry belt outbye the loop take up
   iii. Return belt outbye the loop take up
   iv. Electro hydraulic winch rope

E. Which of the following combinations of maintenance, monitoring and inspection tests would you most likely incorporate in your conveyor management plan?
   i. Thermography, noise, vibration
   ii. Splice alignment, belt cover wear, belt edge condition
   iii. Drive motor RTD, gearbox oil level, cooling module pressure
   iv. LTU tension load cell, belt wander switches, blocked chute

/ 5

Part B – Short Answer

A. What does “Grade S” belting denote? **(2 marks)**

B. Grade S belt testing includes an oxygen index test. What does this test determine? **(2 marks)**

C. AS4606 is called up in Schedule 2 (2) of Work Health and Safety (Mines and Petroleum Sites) Regulation. What does this standard cover? **(2 marks)**

D. Which direction do warps run in a belt? **(2 marks)**

E. As a minimum when should type testing for Grade S belt be carried out? **(2 marks)**

F. Apart from oxygen index what conveyor belt test requirements are required by AS4606?
(2 marks)

G. What conveyor belt test uses a sample 150mm wide and 1,500mm long?
(2 marks)

H. What conveyor belt test uses a sample 300mm wide x 300mm long with covers on? **(2 marks)**

I. A conveyor belt designation of PN 2000/4 means what? **(2 marks)**

J. Is the above belt designation for a solid woven belt, ply belt, or steel cord belt construction?
(2 marks)

/ 20

Question 4: Hydraulics

Part A: Hydraulic schematic circuit.

A. Draw the Australian Standard schematic symbols for the following hydraulic components.
(6 marks)

i. Hydraulic tank

ii. In line filter

iii. Double acting cylinder

iv. Pressure relief valve

v. Fixed displacement pump

vi. Directional control valve – hand lever operated, spring centering, three position, four port, open centre.

/ 6

B. Use all the components identified in question A. above to draw an operational schematic circuit. **(6 marks)**

/ 6

C. Describe how you consider the schematic you drew in B. above will operate through its full sequence of operation. **(6 marks)**

	/ 6

Part B: Fluid power management

D. What are the six (6) key issues associated with pressurised fluids identified in NSW Code of practice: Mechanical engineering control plan? **(6 marks)**

	/ 6

E. To which NSW Resources Regulator Guide would you refer in relation to fluid power system safety at mines? **(1 mark)**

	/ 1

Question 5: Raw water supply system

You are the Mechanical Engineering Manager of a coal mine that requires a completely new water supply system as it transitions into being a longwall mine.
Design and detail the water supply system for the mine surface and underground. Your mine is 140m deep at pit bottom, and will be running a longwall requiring 18 l/s, and three continuous miners each requiring 2 l/s, as well as conveyor sprays, wash down water, etc.

A. Draw the system layout and detail major components and system requirements. **(10 marks)**

/ 10

B. For each of the major components and system parameters identified above provide detail of its specific functionality and why you included it? **(15 marks)**

	/ 15

ESSENTIAL ELEMENTS

Question 6: SB24-09 Safety critical system failures - Steering

You are the Statutory Mechanical Engineer at an underground coal mine and receive a phone call at home approximately 8:15 pm. At around 7:55 pm two workers were in an underground coal mine personnel transport, travelling outbye along the main travel road, when they lost steering control. The vehicle swerved and clipped the left hand rib looking outbye, with the brakes pulling the vehicle up just short of the right hand rib on the far side of an intersection. Although the occupants were uninjured, the vehicle's front suspension, trailing arm and bracket were damaged.

A. Identify five (5) requirements you would instruct the control room operator to pass on to the Undermanager and workers who were in the vehicle. **(5 marks)**

	/ 5

B. In your own words describe the meaning of the term “Safety critical functions”. **(1 mark)**

	/ 1

Essential elements – Question 6C – pass mark 3 out of 4

One or more of the answers are considered essential and must be included in your answer.
If NOT included the candidate will fail and no marks will be awarded for Question 6.

C. List four (4) safety critical functions you would expect to be inspected and confirmed as functioning correctly on an underground mobile plant prestart for a personnel transport. **(4 marks)**

	/ 4

You recollect a similar event described in Safety Bulletin SB24-09, Safety critical system failures of steering systems, that identified the hard pipe had come out of the steer cylinder fitting, dumping the hydraulic oil, and causing the machine to lose power steering. Your personnel transport has recently returned from overhaul that included replacing hard piping in the steer circuit.

D. Apart from the hard piping detaching from the steer cylinder, identify five (5) different failures that may result in loss of steering on underground personnel transports. **(5 marks)**

	/ 5

E. As the statutory Mechanical Engineer what actions would you ensure are taken to prevent a reoccurrence? Describe five (5). **(10 marks)**

	/ 10

Question 7: Earth moving machinery protective structures

There are a number of hazards to operators of heavy earth moving equipment, even when they are wearing a seatbelt, that require the integration of operator protective structures into the equipment design.

A. What is the Australian Standard for protective structures on earthmoving machinery? **(1 mark)**

	/ 1

B. What protective structure(s) does this Australian Standard focus on? **(2 marks)**

	/ 2

C. List five (5) types of heavy earthmoving equipment you would expect to have operator protective structures in place? **(5 marks)**

	/ 5

D. If repairs are required to a damaged operator protective device then what must you ensure in relation to the repairs? **(3 marks)**

	/ 3

Your mine has purchased a second hand 70 tonne excavator to work in the revegetation and remediation area, however, it is not currently fitted with an operator protective structure. Your site Roads and Other Vehicle Operating Area (ROVOA) risk assessment and heavy earthmoving equipment standards of engineering practice require operator protective structures.

E. Who would you involve in the discussion on fitting an operator protective structure on the excavator? Name five (5). **(5 marks)**

	/ 5

F. Detail your understanding of the process required to develop an operator protective structure.
(9 marks)

	/ 9

Question 8: Winder incident

You are the Mechanical Engineering Manager of an underground coal mine and have just received an Investigation Information Release from the Resources Regulator on a recent winder incident at another mine.

NSW Resources
Resources Regulator

NSW GOVERNMENT

Investigation information release

Date: May 2025

Worker struck by conveyance in winder shaft

Incident date: 8 May 2025

Event: Worker struck by conveyance in winder shaft.

Location: [redacted] NSW.

The mine

[redacted] Mine.

The incident

A worker on stage level 4 of the vent shaft 8 winder was struck by a personnel conveyance travelling down the kibble well of the shaft sinking stage about 9.30 pm on 8 May 2025. At the time of the incident, the worker was attempting to provide verbal instructions to a mucker operator at a lower level. To communicate with the mucker operator, the worker extended his head and upper body through a hatch in modified guarding on the stage kibble well. The hatch was not interlocked with the winder control system. The worker suffered minor injuries to the neck and head.

Investigation information release IIR25-05

Figure 1: Personnel conveyance parked at stage level 4 adjacent to the hatch

Your mine is also currently sinking a 6 metre finished diameter downcast shaft by conventional drill and blast using a stage and kibble winder. Ventilation in the blind sink is via a forcing fan through a 900mm diameter duct to shaft bottom with a 5 metre long snorkel delivering fresh air below the stage.

A. What requirements will you implement for performing hot works on the stage? Identify five (5). **(5 marks)**

	/ 5

B. You note from the photos it appears the hatch was a later addition that may affect health and safety. What process would you go through to modify the stage in situ? **(5 marks)**

	/ 5

C. You provide the shaft sinking Contractor with a copy of the incident information release. What actions would you take, or expect the Contractor to take, in relation to your own stage and kibble winder? **(5 marks)**

	/ 5

D. An investigation is underway into the causes and circumstances of the incident. The investigation will examine the effectiveness of controls to eliminate or minimise the risk to health and safety from shaft mining operations. What would you include in an investigation? **(5 marks)**

	/ 5

E. What information would you refer to for guidance? **(5 marks)**

	/ 5

Question 9: Fire on mobile plant

You are the statutory Mechanical Engineer at a coal mine. As part of your role you have coordinated the purchase of a new fleet of mining equipment, including four (4) new hydraulic Excavators, and their associated Haul Trucks. The excavators were assembled, commissioned and signed off at a hard stand on site.

Approximately a month after commissioning, the last of the new excavators is involved in a fire event that results in damage to a number of hoses, electrics and some structure. Fortunately the operator is uninjured, and the fire suppression system has reduced the initial fire. However, hand held fire extinguishers on the excavator and a site water cart were required to completely extinguish the flames.

You suspect a failed or loose hydraulic hose spraying oil on one of the turbo charger blankets and soaking through.

A. Is this event notifiable? **(1 mark)**

	/ 1

B. Under what clause(s) description would you notify this event? **(2 marks)**

	/ 2

The Resources Regulator and Industry Safety and Health Representative release the scene to the Mine for investigation.

C. What are your instructions in relation to the fire affected excavator? Identify three (3) instructions you would make. **(3 marks)**

	/ 3

D. Who would you include in the investigation team? Identify four (4). **(4 marks)**

/ 4

E. Whose witness statements would you be interested in reviewing? Identify four (4). **(4 marks)**

/ 4

F. What other information would you gather? Identify six (6). **(6 marks)**

/ 6

G. Notification of a fire on mobile plant (FoMP) requires the Mine to submit a FoMP ancillary report form. Based on the information supplied in the question, and your subsequent answers, complete the following ten (10) items from the FoMP ancillary report form. **(5 marks)**

i. Portable fire extinguisher on this machine?

ii. Does the machine have a Fire protection system?

iii. How was the fire extinguished?

iv. What was the heat source?

v. Was the heat source lagged?

vi. What was the fuel source?

vii. Was it initiated by combustible fluids?

viii. Was there a failed component?

i. Has the machine ever left site?

ii. Was an introduction to site assessment completed prior to the machine being placed into service?

/ 5

Question 10: Risk Management

Effective Risk Management implementation is one of the strongest tools the Statutory Mechanical Engineer has in their toolbox

A. In your own words what is 'Risk Management'? **(2 marks)**

	/ 2

B. In your own words what is the meaning of 'Risk'? **(1 mark)**

	/ 1

C. In your own words what is the meaning of a 'Hazard'? **(1 mark)**

	/ 1

D. When considering the hierarchy of controls what is the fundamental concept behind each of the three (3) elements listed below and provide an example for each of a control you would implement in the work environment. **(6 marks)**

a. Elimination

b. Substitution

c. Engineering Controls

/ 6

E. When applying risk management techniques in the workplace describe three (3) risk management frame tools, from basic to more formal that are available to all workers, including why and where each would be used. **(3 marks)**

	/ 3

F. At your longwall a fitter was removing armoured face conveyor (AFC) chain joiners as part of a replacement program. The fitter was squatting in the AFC/BSL interlace drive area when the top chain suddenly moved 300 to 400 mm toward the tailgate, trapping his leg against a step in the raceways. The workgroup freed the fitter and they were transported to the surface and then to Hospital. They suffered muscle damage to the right calf but no broken bones. The apparent cause of the crush injury was stored energy in the AFC chain, likely caught across the pans, releasing as the tailgate slow runner pulled the chain to free up slack for joiner removal.

As part of the review of the incident and mechanical engineering control measures it has been identified that the methodologies for working on the face side of the AFC for AFC chain maintenance and repairs has not been supported through any formal risk management techniques. As the Manager of Mechanical Engineering, you are now convening a formal risk assessment and will use the Workplace risk assessment and control (WRAC) tool to conduct this risk assessment.

Using the format tabled below develop the initial format of the risk assessment by completing Event Step, Potential Incident / hazard, and Current controls in preparation for the wider Risk management group to be assembled and undertake the risk assessment.

Event / Step	Potential Incident / hazard	Current controls	**Likeli-hood**	Conse-quence	**Risk rank**	Additional controls
1.						
2.						
3.						
4.						

Event / Step	Potential Incident / hazard	Current controls	**Likeli-hood**	Conse-quence	**Risk rank**	Additional controls
5.						
6.						
7.						
8.						
9.						
10.						

/ 12

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End of document

Mechanical engineering manager of underground coal mines
CME2 – Mechanical engineering legislation applicable to underground coal

Candidate no.: _____

Legislation to be assessed

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- **Essential Question 1 – 16 out of 25 pass mark required**

Marking Sheet

Candidate no.: _____

Question Number		Mark	Available Mark	Marked by *Name*	Summary comments to justify, as necessary
1	**A Essential**		**4**		
	B Essential		**3**		
	C Essential		**8**		
	D Essential		**10**		
	Subtotal		**25**		Pass / Fail
2	**A**		**5**		
	B		**3**		
	C		**17**		
	Subtotal		**25**		Pass / Fail
3	**A**		**5**		
	B		**4**		
	C		**10**		
	D		**6**		
	Subtotal		**25**		Pass / Fail
4	**A**		**5**		
	B		**5**		
	C		**15**		
	Subtotal		**25**		Pass / Fail

Question Number		Mark	Available Mark	Marked by *Name*	Summary comments to justify, as necessary
5	A		10		
	B		2		
	C		10		
	D		3		
	Subtotal		25		Pass / Fail
6	A		5		
	B		5		
	C		10		
	D		5		
	Subtotal		25		Pass / Fail
7	A		5		
	B		5		
	C		15		
	Subtotal		25		Pass / Fail
8	A		12		
	B		3		
	C		10		
	Subtotal		25		Pass / Fail
9	A		6		
	B		6		
	C		7		
	D		6		
	Subtotal		25		Pass / Fail

Question Number		Mark	Available Mark	Marked by *Name*	Summary comments to justify, as necessary
10	**A**		**5**		
	B		**4**		
	C		**2**		
	D		**4**		
	E		**5**		
	F		**5**		
	Subtotal		**25**		Pass / Fail
PAPER	**TOTAL**		**250**	**%**	*Marks checked by:*

If marking is reviewed under approved processes, then examiner is to record details**:**

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Eg. 2/8/19	**Andrew Palmer**	**All**	**Q1 – 4 (previously 5)**	**Found one more criteria**

Essential Question

Question 1: Role of Mechanical Engineer and Content of MECP

Essential – Question 1 A

All of the following questions relate to the Work Health and Safety (Mines and Petroleum Sites) Regulation 2022.

A. Schedule 10 sections 5 and 21 define the role of the Mechanical Engineering Manager and Mechanical Engineer respectively. Subsection 1 (b) in in both clauses relates to supervision. List all four (4) things that are to be supervised. **(4 marks)**

	/ 4

30 Principal control plans

(1) The operator of a mine or petroleum site at which there is a risk to health and safety associated with the mechanical aspects of plant and structures at the mine or petroleum site must—

(a) prepare and implement a mechanical engineering control plan for the mine or petroleum site that sets out the means by which the operator will manage the risks in accordance with section 14, and

(b) ensure the plan is …

Essential – Question 1 B

B. What are the requirements of the Operator that they must ensure in relation to the Mechanical Engineering Control Plan (MECP)? **(3 marks)**

	/ 3

Schedule 2 - 2 Mechanical engineering control plan

(1) The operator of a mine or petroleum site must, in preparing a mechanical engineering control plan, take the following into account in determining the means by which the operator will manage the risks to health and safety from the mechanical aspects of plant and structures at the mine or petroleum site—

Essential – Question 1 C

C. Identify the four (4) items that must be taken into account? **(8 marks)**

	/ 8

(2) A mechanical engineering control plan must set out the control measures for the following risks to health and safety associated with the mechanical aspects of plant and structures at the mine or petroleum site—

Essential – Question 1 D

D. What are the identified risks to health and safety? **(10 marks)**

	/ 10

Question 2: Key statutory functions

The Work Health and Safety (Mines and Petroleum Sites) Regulation 2022 refers to a “key statutory function” at mines and quarries.

A. Schedule 15 Dictionary identifies seven (7) roles at mines that are classed as key statutory functions. List five (5). **(5 marks)**

	/ 5

19 Content of safety management system

(1) The safety management system for a mine or petroleum site must be documented (a safety management system document).

(2) The safety management system document for a mine or petroleum site must set out the following—

(a) the health and safety policy of the operator of the mine or petroleum site, including broad aims in relation to the safe operation of the mine or petroleum site,

(b) the arrangements for managing risks in accordance with section 14, …

(d) the management structure for the management of work health and safety at the mine or petroleum site, including the following— …

B. When considering Section 19 (2) (d) (v) what information are you required to include in the Safety Management System in relation to key statutory functions? **(3 marks)**

	/ 3

C. There are at least seven (7) specific legislated requirements in relation to key statutory functions in the Work Health and Safety (Mines and Petroleum Sites) Regulation 2022.
For the following Sections of legislation summarise these requirements. **(17 marks)**

- 125 Duty to notify regulator of other matters
- 132 Statutory functions
- 133 Obligations on mine operator

	/ 17

Question 3: Supervision

As identified in Question 1, Work Health and Safety (Mines and Petroleum Sites) Regulation Schedule 10 Sections 5 and 21 defines the role of the Mechanical Engineering Manager and Mechanical Engineer respectively. Subsection 1 (b) in in both clauses relates to supervision.

A. Provide specific detail to demonstrate your understanding of the term “Supervision”. **(5 marks)**

	/ 5

B. With the exception of Schedule 10 Sections 5 and 21 identified above, identify and detail the content of two (2) specific sections of legislation that contain Supervision requirements? **(4 marks)**

	/ 4

C. In relation to the organisation structure in a mine, identify the five (5) key duty holders that influence the ability and provide supervision of the maintenance and repair of mechanical plant. For those identified above, detail their function relating to the provision of supervision. **(10 marks)**

	/ 10

D. Outline six (6) key demonstrated skills required of a Maintenance Supervisor that are deemed essential in a Maintenance Supervisor Assessment and detail where these skills may be used. **(6 marks)**

	/ 6

Question 4: Risk management

You are the statutory Mechanical Engineering Manager of a large underground longwall coal mine with a bulk coal winder, drift haulage winders, drift conveyor, around one hundred items of diesel mobile plant, and a coal handling and preparation plant.

A. Describe the mechanism you would utilise to identify and manage the most significant Mechanical Engineering hazards at a mine site. Include details on how it will be implemented. **(5 marks)**

	/ 5

B. When ranking scenarios for risk to health and safety of workers what indicators of severity would you adopt? List five (5) in descending hierarchal order. **(5 marks)**

	/ 5

C. For three (3) of the severity indicators listed above identify the following:
   a. a hazard scenario,
   b. the primary risk to workers, and
   c. three (3) controls specific to that risk that you would implement.

   You **CAN NOT** repeat any controls for each of the scenarios? **(15 marks)**

	/ 15

Question 5: Mine shafts and winding systems

The NSW Code of Practice: Mine shafts and winding systems was published in February 2019 to assist Mine Operators to develop a principal hazard management plan (PHMP) as required by Work Health and Safety (Mines and Petroleum Sites) legislation.

A. Describe in your own words your understanding of the following key terms identified in the Code of Practice. **(10 marks)**

i. Arrestor system

ii. Conveyance

iii. Fail safe

iv. Safety critical system

v. Winding system

/ 10

B. What are the two (2) primary hazards in the form of energy types that are often identified with mine shafts and winding systems. **(2 marks)**

/ 2

Work Health and Safety (Mines and Petroleum Sites) Regulation Section 4 Meaning of “Principal Hazard” states:

In this Regulation, a principal hazard is an activity, process, procedure, plant, structure, substance, situation or other circumstance relating to the carrying out of mining operations or petroleum operations that has a reasonable potential to result in multiple deaths in a single incident or a series of recurring incidents in relation to—

(a) for mining operations—one or more of the following—

(i) ground or strata failure,

(ii) inundation or inrush of a substance,

(iii) mine shafts and winding systems, …

Schedule 1 Principal hazard management plans

3 Mine shafts and winding systems

The following matters must be considered in developing the control measures to manage the risks associated with mine shafts and winding systems—

(a) the potential for instability and loss of integrity of the shaft,
(b) the potential for fires in underground operations, the shaft or winder areas,
(c) the potential for an unintended or uncontrolled movement of conveyances within the shaft,
(d) the potential for a conveyance to fall down the shaft,
(e) the potential for failure of, or damage to, equipment and control measures, including the following— …
(f) the potential for injury to a person from— …
(g) provision for the emergency exit of persons from a conveyance.

C. Section 3 (e) identifies five (5) potential failures of, or damage to, equipment or control measures. What are they? Identify all five (5). **(10 marks)**

	/ 10

D. Section 3 (f) identifies four (4) potential scenarios that may result in injury to a person. What are they? List three (3) of the four (4) scenarios. **(3 marks)**

	/ 3

Question 6: Work Health and Safety Regulation Section 39

Your Mine is planning to conduct heavy lifting work to replace front suspension and steering components on haul trucks, and have purchased a non-proprietary self-propelled lifting jig to assist your workshop team and third party trades in performing the task. It will consist of a self propelled elevating work table fitted with a custom jig cradle designed to accept and affix the suspension strut and allow removal and installation of the suspension strut as well as assembly / disassembly / overhaul without the need to remove the strut from the jig cradle. As this is a new item of equipment being introduced to site you are considering the Mines obligations under Work Health and Safety Regulation Section 39 Information, training and instruction.

39 Provision of information, training and instruction

(1) This clause applies for the purposes of section 19 of the Act to a person conducting a business or undertaking.

(2) The person must ensure that information, training and instruction provided to a worker is suitable and adequate having regard to—

(a) the nature of the work carried out by the worker, and

(b) the nature of the risks associated with the work at the time the information, training or instruction is provided, and

(c) the control measures implemented.

(3) The person must ensure, so far as is reasonably practicable, that the information, training and instruction provided under this clause is provided in a way that is readily understandable by any person to whom it is provided.

As statutory Mechanical Engineer you are reviewing the implementation and introduction of the self propelled lifting jig equipment.

A. When considering s39 (2) (b) above who would you include in determining the nature of risks associated with the task. Identify five (5) people or organisations. **(5 marks)**

	/ 5

B. Identify five (5) potential hazards associate with a mobile work table with jig for removing and maintaining suspension struts. **(5 marks)**

	/ 5

C. As per s39 (2) (c) for each of the five (5) potential hazards described above identify two (2) potential controls to effectively manage the risk. You **CAN NOT** repeat controls. **(10 marks)**

	/ 10

D. When considering 39 (2) (a) and (3) above what information, training and instruction would you provide to workers and tradespeople to ensure the safe use of the mobile work table and jig. Identify five (5). **(5 marks)**

	/ 5

Question 7: Work Health and Safety Regulation Section 206

When considering additional control measures for general plant Work Health and Safety Regulation Clause 206 Proper use of plant and controls states:

(1) The person with management or control of plant at a workplace must take all reasonable steps to ensure that plant is used only for the purpose for which it was designed, unless the person has determined that the proposed use does not increase the risk to health or safety.
(2) In determining whether or not a proposed use of plant increases the risk to health or safety, the person with management or control of the plant must ensure that the risk associated with the proposed use is assessed by a competent person.
(3) The person with management or control of plant at a workplace must take all reasonable steps to ensure that all health and safety features and warning devices (including guarding, operational controls, emergency stops and warning devices) are used in accordance with the instructions and information provided by that person under clause 39.

A. In the context of subclause (1) above what actions would you take to determine that the proposed use of the plant does not increase the risk to health and safety? Identify five (5). **(5 marks)**

	/ 5

B. When considering the risks to health and safety of a coal handling and preparation plant who would you consider a competent person in the context of subclause (2) above. Identify five (5) roles or organisations. **(5 marks)**

	/ 5

C. Select three (3) safety features and warning devices referred to in subclause (3) above, and for each identify five (5) reasonable steps you would take to ensure health and safety. **(15 marks)**

	/ 15

Question 8: Apprentice management

Your Mine has four (4) mechanical apprentices spread evenly from first year to fourth year. The Resources Regulator has advised that due to there having been 27 incidents in the preceding 24 months directly involving mechanical and electrical apprentices in the mining industry, and often resulting in injuries to them, they will be conducting a Compliance Priority Project on apprentice management.

From a mechanical energy perspective the following types of incidents are noted:

- Escape of pressurised substances 5 incidents
- Using tools (hand or power tools) 4 incidents
- Work position awkward or overextending (sprain, strain) 3 incidents
- Entanglement (caught in, pinched by, etc) 3 incidents

The Regulator has released the questions they will be asking during the Program, and these relate to:

- Supervision of apprentices (direct, general and broad)
- Apprentice skills and experience around the task
- Training of tradesmen in supervision of apprentices.

A. What would you include in your documented and implemented training and supervision plan for apprentices? Describe six (6) aspects in detail. **(12 marks)**

	/ 12

B. How would you ensure tradespersons are trained to supervise apprentices, and understand their responsibilities and legal obligations? Describe three (3) actions you would incorporate in your system. **(3 marks)**

	/ 3

C. How would you assess and document the competency of apprentices before allowing them to perform tasks, especially where there is reduced supervision or increased risk (higher pressures, live testing etc)? Describe five (5) aspects in detail. **(10 marks)**

	/ 10

Question 9: Code of Practice - Mechanical engineering control plan

In May 2025, an updated version of the Code of practice: Mechanical engineering control plan (CoP MECP) was uploaded to the Resources Regulator website.

A. What is you understanding of the following Key Terms.**(6 marks)**

Maintenance strategy

	/ 2

Safety Critical System

	/ 2

Life cycle

	/ 2

B. The MECP is a principal control plan (PCP) used to manage risks associated with the mechanical aspects of plant and structures at a mine. There are significant risks of workplace death and injury associated with using plant and associated structures, typically resulting from insufficient control of mechanical energy. Describe three (3) fundamentals that when combined lead to a controlled work environment. **(6 marks)**

	/ 6

C. Table 1 in Section 3.2.1 Energy sources associated with plant and structures lists nine (9) categories of energy hazards associated with mechanical aspects of plant. Identify seven (7) of these. **(7 marks)**

	/ 7

D. The WHS Regulation (Chapter 5, Part 5.1, Division 7) includes specific duties in relation to plant, other than plant that relies exclusively on manual power for its operation and designed to be primarily supported by hand, such as a screwdriver or hammer. Duties include requirements for PCBUs with the management or control of plant to (amongst other things) do what to manage risks to health and safety? Identify all three (3). **(6 marks)**

	/ 6

Question 10: Forklifts and telehandlers

Part A: Short Answer

A. Forklifts and telehandlers are used extensively throughout the mining industry and often require specific controls for their safe operation and maintenance. **(5 marks)**

i. What term is used in Work Health and Safety legislation to describe a forklift?

ii. What Australia Standard series are forklifts and their attachments required to meet?

iii. The Australian Standard that specifies safe use of telescopic handlers (telehandlers) is includes in which series?

iv. What are the requirements for an operator of a telescopic handler (telehandler) fitted with forklift tynes?

v. What class of HRWL is required to operate a 4 tonne capacity non-slewing telehandler?

/ 5

Part B: Forklift and telehandler management

B. WHS Regulation 2017 Section 218 relates to the type of equipment in Part A. List four (4) of the requirements under this section. **(4 marks)**

	/ 4

C. List two (2) requirements that an operator must meet before operating a forklift. **(2 marks)**

	/ 2

D. List four (4) major hazards associated with forklift operation. **(4 marks)**

	/ 4

E. List five (5) control measures that can be used to reduce the risk of a forklift tipping over. **(5 marks)**

	/ 5

F. You intend to use a non-slewing 4 tonne telehandler to lift a suspended load.

i. Describe three (3) requirements regarding the equipment that must be met before lifting a suspended load? **(3 marks)**

	/ 3

ii. Would a dogging licence be required to conduct this operation? Explain your answer. **(2 marks)**

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