Mining engineering manager of underground coal mines
MB1 – Legislation

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: Tuesday 4 March 2025 12:50pm
End date/time: Tuesday 4 March 2025 2:00pm
Duration: 01:10

Instructions to candidates

- A HIGHLIGHTER ONLY (no pencil/pen) can be used during reading time
- 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
- 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 five (5) questions are to be attempted
- All questions are of equal value - 20 marks each

CANDIDATE NUMBER: _____ **(write in from your letter)**

Question Number		Mark	Available mark	Marked by *Name*	Summary comments to justify, as necessary
1			20		
	Subtotal		**20**		
2			20		
	Subtotal		**20**		
3	a		2		
	b		5		
	c		3		
	d		10		
	Subtotal		**20**		
4	a		6		
	b		4		
	c		10		
	Subtotal		**20**		
5	a		6		
	b		8		
	c		6		
	Subtotal		**20**		
PAPER	**TOTAL**		**100**		*Marks checked by:*

Question 1

Section 18 of the WHS Act describes what is reasonably practicable in relation to managing health and safety. Detail the key elements of section 18. **(20 marks)**

Question 2

Clause 27 of the WHS Act notes Duty of officers and, details the exercising of due diligence. What are the duties of an officer and what are the reasonable steps of due diligence? **(20 marks)**

Question 3

When referencing the Work Health and Safety Regulation 2017 Part 3.1 Managing risks to health and safety, list the requirements referred to under the following headings. **(Total 20 marks)**

A) Managing risks to health and safety – **2 marks**

B) Hierarchy of control measures – **5 marks**

C) Maintenance of control measures – **3 marks**

D) Review of control measures – **10 marks**

Question 4

When referencing the Work Health and Safety (Mines and Petroleum Sites) Regulation 2022 Schedule 1 Principal hazard management plans, list the matters that must be considered in developing the control measures to manage the risks of the following hazards. **(Total 20 marks)**

A) Spontaneous combustion – **6 marks**

B) Air quality or dust or other airborne contaminants – **4 marks**

C) Roads or other vehicle operating areas – **10 marks**

Question 5

You wish to carry out electric welding work on longwall equipment within the hazardous zone. No underground welding work has been carried out previously at the mine. **(Total 20 marks)**

Explain:

A) What legislation must be complied with to allow welding to proceed? **(6 marks)**

B) How you would comply with these legislative requirements? **(8 marks)**

C) How you would comply with any guidelines? **(6 marks)**

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Mining engineering manager of underground coal mines
MB2 – Mine ventilation

Candidate no.: _____

Legislation to be assessed

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- *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: Wednesday 5 March 2025 8:50am
End date/time: Wednesday 5 March 2025 12:00pm
Duration: 03:10

Instructions to candidates

- A HIGHLIGHTER ONLY (no pencil/pen) can be used during reading time
- Answers are to be written in the allocated spaces within this booklet ONLY
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- Additional space is provided at the end of the paper. Please label which question the answer relates to.
- All two (2) questions are to be attempted
- All questions are of equal value - 100 marks each

CANDIDATE NUMBER: _____ **(write in from your letter)**

Question Number		Mark	Available mark	Marked by *Name*	Summary comments to justify, as necessary
1	a		40		
	b		40		
	c		20		
	Subtotal		**100**		
2	a		20		
	B1		40		
	B2		15		
	c		15		
	d		10		
	Subtotal		**100**		
PAPER	**TOTAL**		**200**		*Marks checked by:*

Question 1

Total 100 marks

The Middleton Mine (see mineplan) is located in the Hunter Valley of NSW and has historically mined the Sager seam via bord and pillar methods. The mine has recently commenced longwall mining and is currently extracting it's second longwall block (LW 502). You have been recently employed as the mining engineering manager and you are required to review the ventilation, gas drainage, and gas monitoring design for the mine.

The mine is planning to produce 5.0 Mt per annum from the longwall (200m face) via 5 day production - with maintenance and non-production support tasks conducted on weekends. There are 3 development units producing an additional 650kt per annum.

Access to the Sager seam is via two surface to seam drifts at a grade of 1:8 and 1,200m in length 6m wide and 5m high (1x conveyor drift and 1x men and material drift).

Mine ventilation currently exhausts via a 5.5m diameter upcast shaft (located near the bottom of the access drift) which is fitted with 2 centrifugal fans.

The mine had a significant spontaneous combustion event in the 425 bord and pillar extraction panel (see mineplan) whilst mining in the area around the major dyke structure. The event was able to be managed via flooding and production was then successfully recommenced.

The Sager seam has the following characteristics:

- Average thickness of 3.0m
- Semi-soft coking coal
- R70 testing suggests a 'low to moderate' spontaneous combustion propensity
- Immediate roof 1.0m thick coarse grained sandstone (30MPa) – overlain by 20m of fairly competent interbedded siltstone/mudstone
- Immediate floor – fairly competent interbedded siltstone/mudstones
- The seam dips to the southwest at an average of 1:20
- A major dyke structure runs across the longwall panels splitting the mine into 2 distinct gas domains
    - Zone A - Mains and outbye side of dyke
        - Total gas content 5 m3/t
        - Gas composition 80% CH4 / 20% CO2
        - Permeability 10mD
    - Zone B – Inbye side of dyke
        - Total gas content 10 m3/t
        - Gas Composition 50% CH4 / 50% CO2
        - Permeability 1mD

The Munro seam lies approximately 20m above the Sager seam – it is 1.0m thick and has very similar total gas content, gas composition, R70, and permeability characteristics to the Sager seam.

A) Identify all key factors to be considered in the ventilation, gas drainage, and gas monitoring design. Your answer should include, but not be limited to: outburst, gas management, spontaneous combustion, and mine operation. **(40 marks)**

B) Explain and justify how each of the issues you have identified will be managed in your ventilation network. **(40 marks)**

C) What are the treatment options for the gas management issues now and in the future, and how would you manage the issues? **(20 marks)**

Question 2

Total 100 marks

On the accompanying Middleton Mine mine plan:

A) Show the locations of all production areas, together with their daily production levels, ventilation quantities and expected gas makes **(20 marks)**

B) Ventilate the mine plan

1. Using the Survey and Draft Directions for Mining Surveyors (NSW Mines) – version 2.0 May 2020, addressing the issues identified in Q1 **(40 marks)**

2. Show the air quantities, with justification for quantity selected, in each panel **(15 marks)**:

i. In the intakes of each production panel at the commencement of the ‘hazardous area’

ii. In the returns of each production panel at the outbye end (prior to air joining the Mains returns)

C) Show the location and type of gas monitoring sensor for each production area and outbye areas of the mine. Indicate alarm level limits at each sensor with supporting logic **(15 marks)**

D) Show the outbye ventilation quantities **(10 marks)**:

- Quantity of air entering each surface intake entry
- Quantity of air leaving each return surface exit (including the associated fan operating pressure)

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Mining engineering manager of underground coal mines
MB3 – Coal mining practice

Candidate no.: _____

Legislation to be assessed

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- *Work Health and Safety (Mines and Petroleum Sites) Regulation 2022*
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Exam details

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Venue: Tocal College
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Start date/time: Tuesday 4 March 2025 8:50am
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- Additional space is provided at the end of the paper. Please label which question the answer relates to.
- Only five (5) out of eight (8) questions are to be attempted
    - Section A – four (4) out of (6) underground questions and
    - Section B – one (1) out of two (2) open cut questions
- All questions are of equal value - 20 marks each

CANDIDATE NUMBER: _____ **(write in from your letter)**

Question Number		Mark	Available mark	Marked by *Name*	Summary comments to justify, as necessary
1	a		3		
	b		5		
	c		2		
	d		4		
	e		5		
	f		1		
	Subtotal		**20**		
2	a		4		
	b		5		
	c		3		
	d		3		
	e		5		
	Subtotal		**20**		
3	a		4		
	b		4		
	c		4		
	d		4		
	e		4		
	Subtotal		**20**		

CANDIDATE NUMBER: _____ **(write in from your letter)**

Question Number		Mark	Available mark	Marked by *Name*	Summary comments to justify, as necessary
4	a		5		
	b		5		
	c		4		
	d		6		
	Subtotal		**20**		
5	a		5		
	b		5		
	c		8		
	d		2		
	Subtotal		**20**		
6	a		6		
	b		6		
	c		8		
	Subtotal		**20**		
7	a		3		
	b		5		
	c		5		
	d		4		
	e		3		
	Subtotal		**20**		

CANDIDATE NUMBER: _____ **(write in from your letter)**

Question Number		Mark	Available mark	Marked by *Name*	Summary comments to justify, as necessary
8	a		6		
	b		8		
	c		6		
	Subtotal		**20**		
PAPER	**TOTAL**		**100**		*Marks checked by:*

Question 1

Section A

(Total 20 marks)

You are the MEM of an underground coal mine. The mine has rubber tyre vehicle access into the underground via a drift. Due to continued degradation of the access it has been decided to concrete an apron at the entry and continue a concrete road from the drift entry to the muster area. Due to the project nature of this work, contractors will be used to plan, prepare and construct the road and apron using their own labour and equipment. The supervision and management of the works will also be by the contractor.

A) Explain the legislative requirement of what information you need to supply to the contractor and what information the contractor needs to supply to you? **(3 marks)**

B) Explain how you would evaluate suppliers to choose a contractor to do the work? **(5 Marks)**

C) Given the contract will specify that the contractor is responsible for the management, supervision, design and installation of the works, what is your legislative duty and what is the duty of the contractor? **(2 Marks)**

D) What do you need to do under your duties, and what does the contractor need to do under their duties? **(4 Marks)**

E) List the items that you believe would be significant risks for the work and the controls you would expect; **(5 Marks)**

F) How would you determine who is responsible and for which individual controls to address the risks? **(1 Mark)**

Question 2

Section A

Total 20 marks

You are the MEM of an underground coal mine. The longwall is currently in the 'bolt-up' phase of production in the current panel and has commenced bolting the roof at every shear in preparation for recovery of the equipment. You are utilising 'rapid face bolters' along the AFC to install bolts and mesh. You have been notified of an incident where one of the two rapid face bolters has detached from the AFC and rolled towards the face whilst in operation.

A) What are your immediate actions after being informed of the incident? **(4 Marks)**

B) What are the causes or likely causes of this event and what implications do they have for health and safety matters? **(5 Marks)**

C) What other safety risks may be created or increased as a consequence of this event? **(3 Marks)**

D) For the risks you describe in (c) above, describe how you going to manage these risks? **(3 Marks)**

E) Detail the process you would take to resume bolting on the LW face and, assessment of any change in risk. **(5 Marks)**

Question 3

Section A

Total 20 marks

You are the MEM of an underground longwall mine that is moderately gassy with seam gas being 98% methane. The mine is ventilated by a main fan arrangement that consists of two VVVF drive fans in parallel on a single upcast shaft with approximately 450m^3/s capacity at 2300Pa. The mine also has a smaller fan located on a 1m diameter shaft that extracts air from a backroad heading that draws air inbye the longwall and past the back of previously extracted longwalls. This ventilation allows for access inbye the active longwall face in a single entry roadway, and amongst other things allows for the development of the subsequent longwall installation face road to hole into a ventilated and maintained roadway. The fans is a single axial fan, variable speed with capacity approximately 30m^3/s at 900Pa.

At 12:04am you have been informed that an electrical supply fault has stopped the fan that ventilates the backroad. Repairs are commencing.

A) What are your immediate actions to this situation? **(4 Marks)**

B) What are the hazards and risks that you expect to be created by this situation? **(4 Marks)**

C) Detail the procedural controls that you would expect to have in place to manage this situation, including location of personnel. **(4 Marks)**

The fan has been off for over 12 hours whilst repairs are made, and is now ready to restart. However the monitoring at the base of the ventilation shaft is showing a concentration of 6% methane.

D) Explain the process you would use to reventilate the roadway and detail the management of the methane concentration at the fan. **(4 Marks)**

E) Detail what you would do should the plan you have above not be effective is diluting the methane concentration and re-establishing full ventilation of the roadway. **(4 Marks)**

Question 4

Section A

Total 20 marks

You are the Mining Engineering Manager of an underground coal mine that is extracting coal from a 2.3m thick seam at a depth of 250m. The coal seam is liable to spontaneous combustion and the seam has a 90% methane content at 5m3/t.

LW panels are serviced by two heading gate roads. The current LW face has had a significant strata failure along the face preventing access across the face. The LW face equipment is old, iron bound, and the owners have decided the equipment will not be recovered. The ventilation across the LW face has reduced to 15m3/s with the TG general body methane steady at 0.9%.

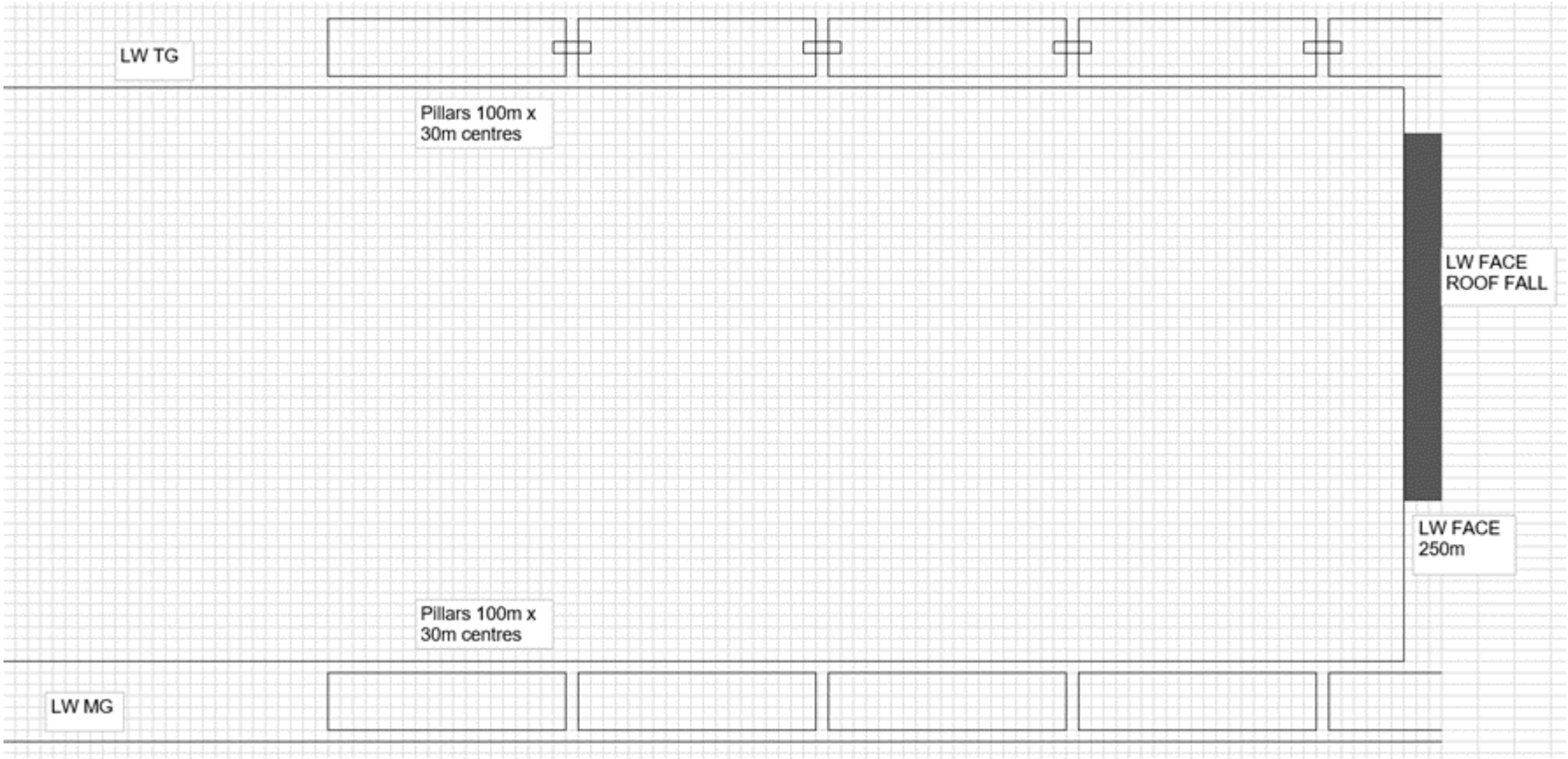
The owners have decided to recover the remainder of the LW block 200m wide x 900m long by recovering the coal using an extraction process involving a continuous miner.

A) List 5 of the most significant risks and hazards that will need to be addressed. **(5 marks)**

B) Briefly describe how you would address each of these issues you have identified. **(5 marks)**

C) As the Mining EM list the notifications required by the WHSMPSR 2022 from the strata failure to beginning to mine coal with the c/miner. **(4 marks)**

D) Sketch a mining sequence cycle that would involve minimum risk to extract the remaining block of coal. The candidate would need to demonstrate a repetitive process and one cycle. **(6 marks)**


LW TG
Pillars 100m x
30m centres
LW FACE
ROOF FALL
LW FACE
250m
Pillars 100m x
30m centres
LW MG

Question 5

Section A

Total 20 marks

You are the Manager of Bigrock Colliery, a large Longwall mine with a Longwall and two development panels in operation. The mine is ventilated using three centrifugal fans located at the top of a 5.5m diameter shaft located at 1 c/t E heading.

The mine is accessed by two Drifts, a man/materials drift which is 900m long at a gradient of 1 in 6 and a conveyor drift that is 600m long at 1 in 4. There is a 5,000 tph 1800 wide steel cord conveyor that runs up the conveyor drift. The conveyor is slung from the roof throughout the drift and is floor mounted at 1 c/t where it runs in seam as far as 29 c/t where the first of 3 similar trunk conveyors load onto it.

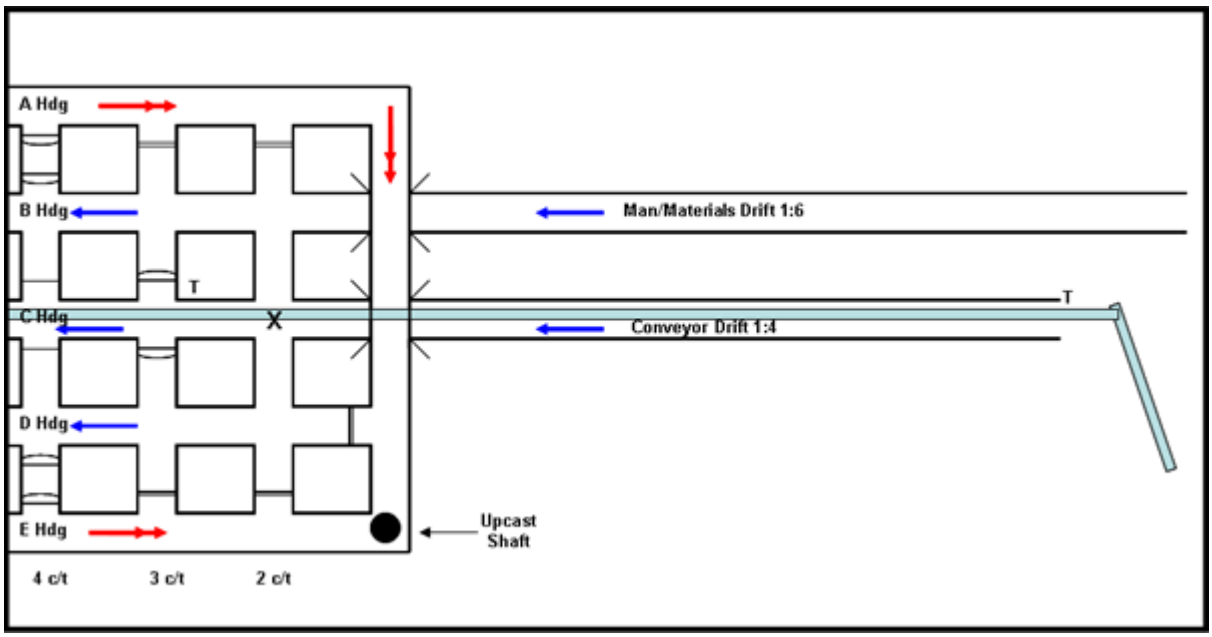
There are a total of 3 trunk conveyors running sequentially, namely Trunk 1, 2 and 3, each with the same 5,000 tph capacity. Longwall and Development panels load onto these trunk conveyors.

There is a vehicle underpass at 2 c/t C heading where there is guarding around the structure to prevent spillage and the road has been undercut to allow vehicles to pass under the conveyor and access both B and D headings as travel roads, thus allowing for a one-way system of traffic control to be in place. Traffic going into the mine crosses under the belt at 2 c/t and travels in via D heading. Traffic coming out of the mine travels straight out of B heading. Traffic access to the man and materials drift is controlled by a manually operated block light system at both top and bottom of the drift.

It is possible for man transporters and smaller LHD machines to travel up and down the conveyor drift and a similar block light system is in operation in this drift. Access to this travel route is via the hydraulically operated vehicle doors at 3 c/t.

It is 2:00 PM when you receive a telephone call in your office from an outbye Deputy. He said that he was on the surface having crib when a belt fitter notified him that the drift conveyor appears to have broken on the top approximately 200 m from the top of the Drift. The top belt inbye of the break appears to have run back down the Drift and the belt is piled up and concertinaed in the vehicle underpass at 2 c/t. There appears to be considerable damage to structure in this area from what he could see and there is a lot of spillage of coal as the conveyor was loaded at the time of the break. The bottom belt seems to be being held in place by the drive pulleys and has not run back down the drift. The Deputy says he has not walked the conveyor drift to check the extent of the damage.

Refer to the entry section of the mine plan below.



A) What are your immediate actions? **(5 marks)**

B) Describe the processes that are in place in the mine's safety and health management system to deal with this situation. **(5 marks)**

C) What is the course of action you are going to take? **(8 marks)**

D) What are the implications to the mine apart from the obvious production implications? **(2 marks)**

Question 6

Section A

Total 20 marks

You are the Manager of Mining Engineering at a mine that produces 5 million tonnes / year from a longwall and 2 development unit. The inseam gas content is $3m^3$/tonne of which 95% is CH4. The mine pumps out 15ML of wastewater / day. The mine has a medium propensity to spontaneous combustion.

The mine has 4 entries:

1. Drift - 1400m long, 5.5m wide and 3.2m high, Grade 1 in 3.5, contains conveyor belt and Dolly Car with man riding capacity of 15 people
2. Down cast shaft – 5m diameter, contains elevator with 14 man capacity
3. Down cast shaft – 3.5m diameter no man riding
4. Up cast shaft – Main ventilation fan fitted on the surface, no man riding capacity

You receive a phone call at 3am on a Wednesday morning that there has been a roof fall in the drift 400m from the surface, the fall is full width of the drift and approx. 5m high, the fall material has choked off the drift so as the ventilation has been restricted to $10m^3$/sec. The mine was in full production at the time of the fall. The dolly car was on the surface with a flat top loaded with supplies about to go underground.

A) What are your immediate actions and why? **(6 marks)**

B) What actions are required to maintain the mine whilst the fall recovery is taking place? **(6 marks)**

C) Outline the process used to recover the fall and return the mine to normal operation. **(8 marks)**

Question 7

Section B

Total 20 marks

You are the MEM of a open cut coal mine that utilised truck and shovel fleets to mine multiple seams from two main pits. The coal haulage to the ROM pad results in haulage from both pits combining at a 4 way intersection.

You receive a call at 9:22pm notifying you of an incident at the 4 way intersection where a light vehicle failed to give way to a 930E haul truck that was entering the ROM pad. The light vehicle was approaching the intersection from the North with intention to turn onto the haul road and head West. The haul truck was approaching from the West and intended to continue travelling Easterly through the intersection into the ROM. The haul truck operator noticed the light vehicle failing to slow as they entered the intersection and took evasive action, partially turning right and braking. The vehicles ended up 10m from each other with the light vehicle stopped in the original path of the haul truck.

A) What are your immediate actions **(3 Marks)**

B) State the plans you would have in place for the operation of mobile vehicles in the mine and the key aspects of that plan? **(5 Marks)**

C) In relation to this incident, what documented standard would you be referencing with inspecting the scene, and what would you be looking for? **(5 Marks)**

D) What are the likely causes of the incident? **(4 Marks)**

E) What actions would you take to prevent a reoccurrence? **(3 marks)**

Question 8

Section B

Total 20 marks

You are the Mining Engineering Manager of an Open Cut coal mine.

The following incident has occurred.

A bulldozer working on a coal stockpile dropped into a void above a conveyor feed valve point.

A) What controls would you expect to be in place to prevent this type of incident from happening? **(6 marks)**

B) What requirements would you expect to be in place for protection of the dozer operator? **(8 marks)**

C) How would you recover the operator? **(6 marks)**

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