Electrical Engineer of coal mines other than underground coal mines CEE3 – Legislation, Australian Standards and electrical engineering applicable to open-cut mining

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 2024*

Exam details

Region: New South Wales
Venue: Tocal College
Room: North Court
Start date/time: Wednesday 24 September 2025 12:50pm
End date/time: Wednesday 24 September 2025 4:00pm
Duration: 03:10

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
- 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.

- It is expected that the candidates will present their answers in an engineering manner, making full use of diagrams, tables, and schematics appropriate, and

showing full workings in calculations. **Poor legibility in diagrams and handwriting** may affect the candidate being deemed non-competent

- **All 10 (ten) questions are to be attempted.** All questions are of equal value.
- If a question is identified as **ESSENTIAL**, the candidate must get the set number of marks to pass the question. If they do not pass these **ESSENTIAL** question(s), they do not pass this paper
- **You must pass the essential questions and obtain a total of 60 marks to pass this paper**

Marking Sheet

Q #	Marks	Available Marks	Marked by *initials*	Summary comments to justify
1		10		
2		10		
3		10		
4		10		
5		10		
6		10		
7		10		
8		10		
9		10		
10		10		
Paper Total		**100**		*Marks checked by*

Question 1

Answer the following questions in relation to Clause 34 of the Work Health and Safety Mines and Petroleum Regulation.

A) In managing risks to health and safety associated with electricity at the mine or petroleum site, explain the 2 (two) requirements the operator must ensure before a circuit is first energised at the mine or petroleum site, or is first energised following the circuit being recommissioned. (2 marks)

B) What are all electrical installations other than isolated circuits required to have? (1 mark)

C) What are plans of electrical installations at the mine or petroleum site required to be showing? List 6 (six). (3 marks)

D) Finish the sentence. (1 mark)

Arrangements are in place for switching the power off or restoring power as part of

E) An effective earth system is provided at the mine or petroleum site to minimise, as far as reasonably practicable. List these 2 (two) things. (1 mark)

F) Finish the sentence. (1 mark)

Short circuit protection and over current protection is provided on

G) Finish the sentence. (1 mark)

The reliability of electrical safeguards provided to control the risk from both electrical and non-electrical hazards is

Question 2

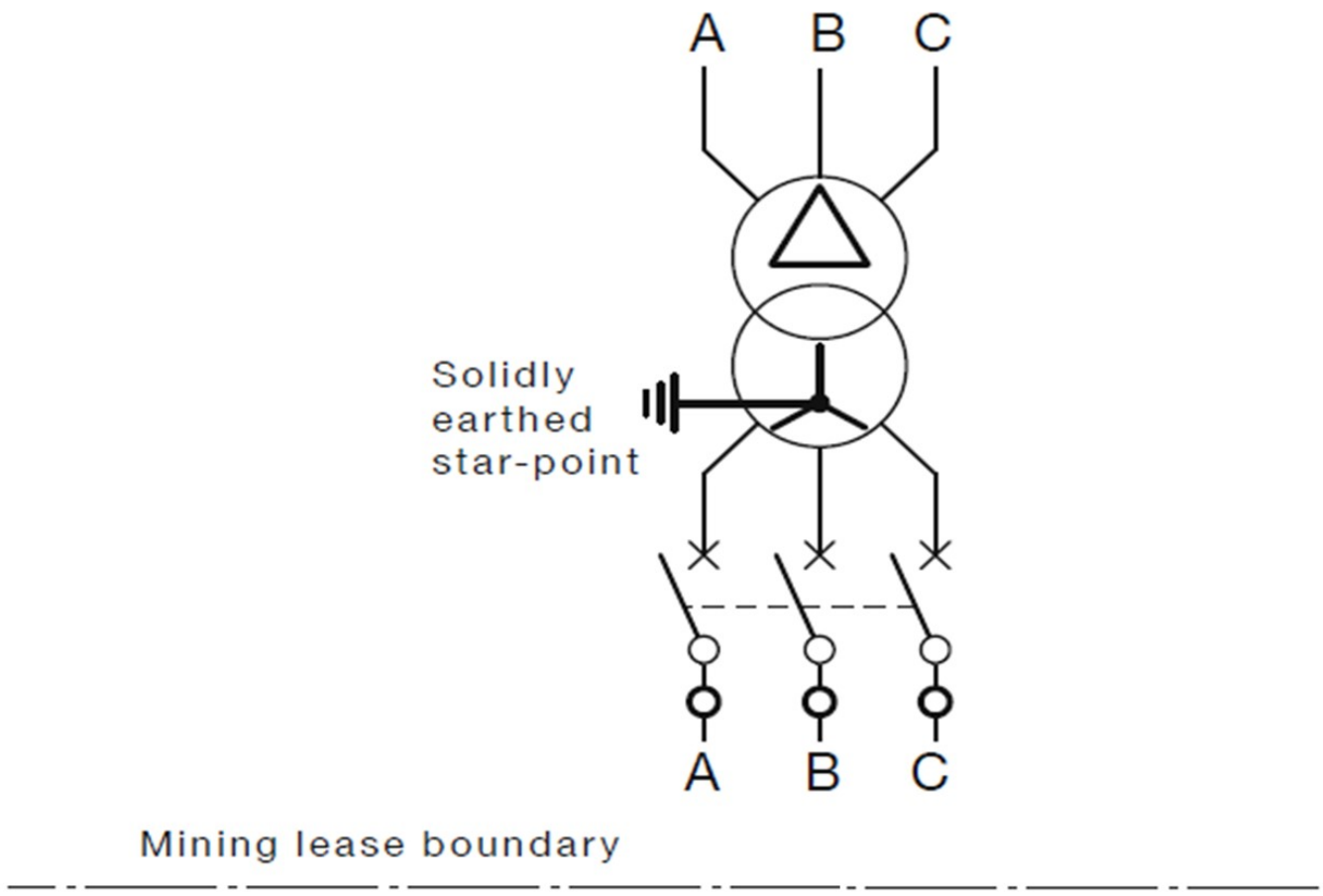
A) Define 6 (six) protection devices within this standard's Scope. (3 marks)

B) What earthing arrangement is the standard relevant for? (1 mark)

C) Fill in the missing words of the following statement. (3 marks)
Earthing Systems are utilised to ensure that _____ potential differences do not exist on exposed _____ parts of electrically powered plant and equipment. Earthing _____ form an integral part of the earthing system by _____ the exposed conductive parts of electrically powered plant and equipment together so that under a fault condition _____do not rise to levels that can be _____ to people.

D) Draw a 3-phase circuit diagram showing the typical earthing arrangement for a mine reticulation system when the system is supplied from a supply authority substation consisting of a 132kV/22kV Δ/ Y Solidly earthed transformer and the mine's reticulation system is at 11kV. Include and label relevant earthing and protection devices. (3 marks)

Note: Use AS1100 Standard Electrical Drawing symbols.



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Question 3

Answer the following questions in relation to AS 1674.2:2025.

A) AS 1674.2:2025 has been released. What is the approach you would take to understand the standard and ensure any required changes are implemented at your site? List 3 (three) steps. (2 marks)

B) What does AS 1674.2 require to be considered in your risk assessment before welding? List 4 (four). (2 marks)

C) Describe the following welding environments: (1.5 marks)

Category A

Category B

Category C

D) Describe 4 (four) controls from the standard that you would implement in a Category C environment. (2 marks)

E) What is the role of a Welding Safety Observer? (1 mark)

F) List the 3 (three) Hazard Reducing Devices described in AS 1674.2. (1.5 marks)

Question 4

A) What are the key hazards associated with operating a reclaim tunnel in a coal mine, as listed in MDG28? List 6 (six). (3 marks)

B) List 6 (six) minimum controls, that must be implemented in a reclaim tunnel, per guidance from MDG28. (3 marks)

C) List 5 (five) minimum controls, in MDG28, for a dozer working on a draw down point above the reclaim tunnel, where there is risk of engulfment present? (2.5 marks)

D) For a fixed gas detector installed in a reclaim tunnel, list the frequency for the following inspections and testing you would expect to see. (1.5 marks)

Activity	Frequency
External Inspection	
Calibration	
Telemetry Test	

Question 5

(ESSENTIAL QUESTION) You must obtain 5 marks or more to pass this question and this paper.

A) Who is responsible for developing and reviewing standards for electrical installations at a mine? (1 mark)

B) What key responsibilities are included in the statutory function of the Electrical Engineer (open cut)? (1 mark)

C) What time period must the operator of a mine or petroleum site keep a record that forms part of the record for the mine or petroleum site? (1 mark)

D) Who can issue a “Provisional Improvement Notice” at your mine site, under S90 of the Work Health and Safety Act? (1 mark)

E) What time period is a notification required to be made under Cl124 of the Work Health & Safety Mines and Petroleum Regulation? (1 mark)

F) What time period is a notification required to be made under Cl190 of the Work Health & Safety Mines and Petroleum Regulation? (1 mark)

G) What is the meaning of a principal hazard? (1 mark)

H) What requirements are placed on the PCBU to consult with workers? (1 mark)

I) Describe when consultation is required with workers? List 4 (four) (2 marks)

Question 6

The open cut coal mine where you are the statutory electrical engineer operates a gas drainage field consisting of a large number of Surface-to-Seam (SIS) wells, and associated borehole dewatering pumps and gas capture and containment infrastructure as well as return water dam and pumps. The water pumped from the boreholes reports to a containment dam in the vicinity of the boreholes.

Due to increased ground water levels from recent wet weather events, increased borehole pumping discharge has seen the need to update the pumping capacity from the containment dam back into the site's mine water reticulation system.

You are requested to urgently install a skid mounted 45kw 415V 2 pole pump and motor set and supply this from an existing Supply authority's rural power supply which includes a 200kVA DYN11 433V 5% step-down transformer with 5 taps ranging from -5% to +5% in 2.5% increments.

Neighbouring properties many kilometres upstream of this transformer are connected to this same 22kV rural feeder.

The dam and pump is situated ~200m from the pole mounted transformer which cannot be relocate due to supply authority requirements.

(Clearly state any assumptions)

A) Calculate the full load current of the motor. (2 marks)

B) Provide an estimate of the Direct-on-line (DOL) starting current. (2 mark)

C) Calculate the voltage drop (Neglect supply side constraints) at the transformer secondary terminals during:

i) Full load operation (2 marks)

ii) DOL starting (1 mark)

D) Sketch a typical speed torque curve for the motor and pump. Clearly label the following: (3 marks)

i. The indicative operating point of the pump motor combination
ii. Typical pump load curve
iii. Locked rotor torque
iv. Pullout torque
v. Acceleration torque

Question 7

You are asked to provide guidance on the number of electrical apprentices the open cut coal mining operation you are employed by can engage on a new electrical apprentice program.

A) List 3 (three) skills required of persons providing supervision to apprentices on an NSW open cut coal mine site. (3 marks)

B) Name the levels of supervision and the definition for each of the levels. (3 marks)

C) What supervision is required for isolating, testing (for dead) or, energising a circuit? (1 mark)

D) What factors are a Supervising tradesman required to consider in determining the level of supervision an apprentice requires? List 3 (three). (3 marks)

Question 8

You are currently employed as the Statutory Electrical Engineer at a coal mine and have been immediately notified, via a phone call that an electrician has received an electric shock. You have identified that the electric shock was received whilst performing insulation resistance testing (1000V) on a haul truck HV wheel motor, whilst trying to remove the test clamps.

A) List 3 (three) immediate actions you would undertake. (1.5 marks)

B) Is this incident notifiable under the Work Health and Safety (Mines and Petroleum) Regulation? Explain your answer. (1 mark)

C) Who would you involve in the investigation? List 4 (four). (2 marks)

D) Would this scenario be defined as “direct” or “indirect” contact? (0.5 mark)

E) Draw the circuit of the electric shock current path and list any assumptions. (3 marks)

F) Apply the hierarchy of controls, list 4 (four) controls you would expect to be in place to eliminate or mitigate the risk of electric shock. (2 mark)

Question 9

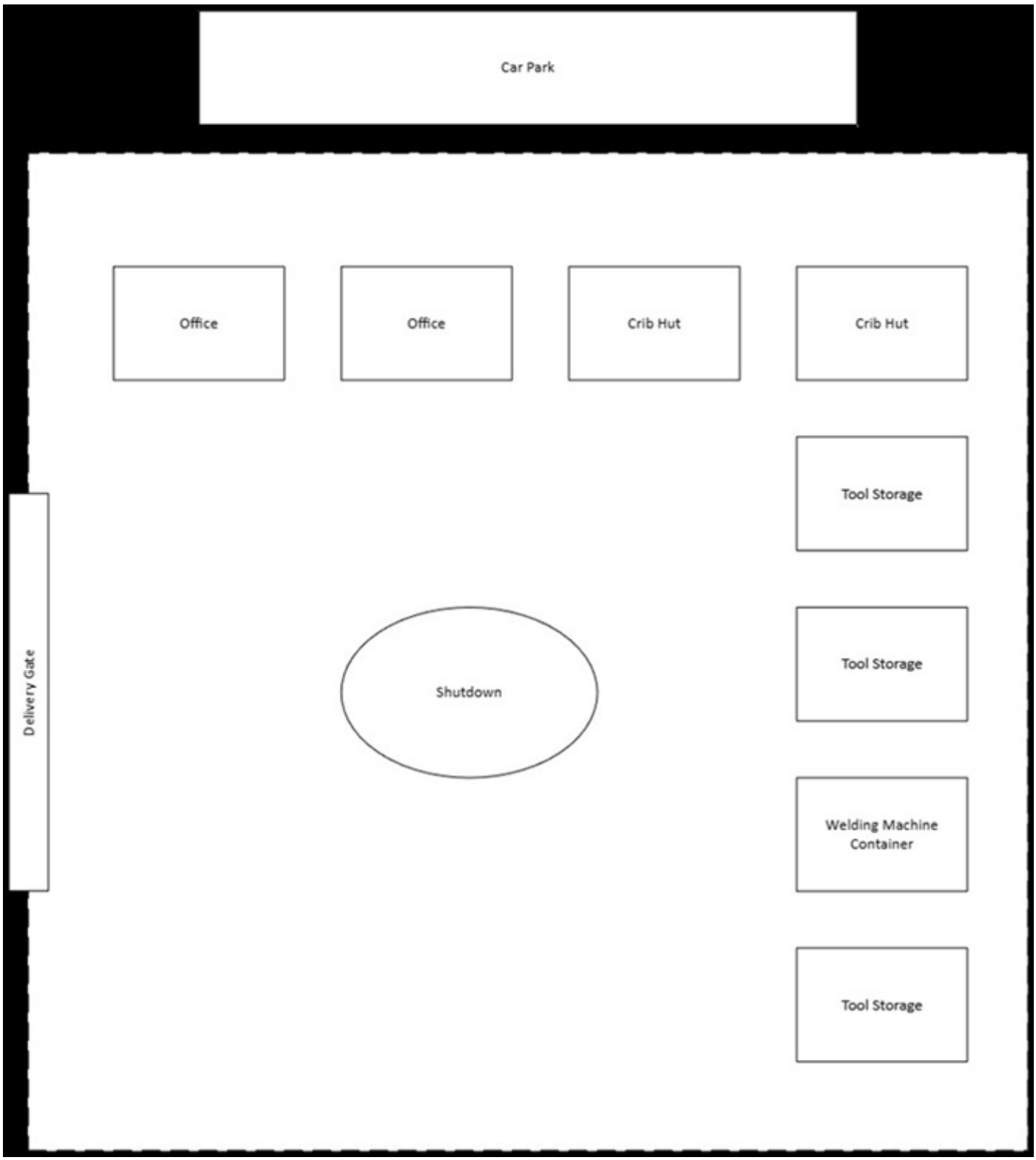
You are required to install a temporary power supply by generators for demountable buildings that will be used as the office and workshop for a shutdown.

A) List the 4 (four) main documents (e.g. standards, policies) you would use to guide the installation and provide a short description of why they apply to this scenario? (2 marks)

B) Below is a general arrangement drawing of the site layout.

Complete the drawing with the following and explain your workings: (6 marks)

- Expected electrical loading details to allow you to calculate the required power supply.
- Location where you would install the generator(s) and any other temporary electrical equipment
- Size of the generator(s)
- Any earthing arrangements (Location, material, size)


Car Park
Office
Office
Crib Hut
Crib Hut
Tool Storage
Tool Storage
Shutdown
Welding Machine Container
Tool Storage
Delivery Gate

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C) Describe any earth leakage protection you would have in place and any discrimination to the scheme that is applied. (2 marks)

Question 10

You have recently been employed at a large surface coal mine as the statutory electrical engineer. There are two (2) high voltage 4100 XPC AC shovels, supplied by 6.6kV high voltage trailing cable, from 4 transportable substations.

A) What design standard shall high voltage trailing cables conform to? (1 mark)

B) Why is earth continuity critical for the safe operation and use of trailing cables? (1 mark)

C) Testing of high voltage trailing cables, shall be completed in line with the requirements listed in, AS 1747:2003 Reeling, trailing and feeder cables used in Mining – Repair, testing and fitting of accessories. List 5 (five) tests/inspections required, post a repair, that a typical trailing cable will undergo. (5 marks)

D) You have found that there is no standard for trailing cable management onsite. In building a trailing cable management plan, list 6 (six) key considerations that should be taken into account, for moving and handling trailing cables (3 marks)

END OF QUESTIONS

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