

EIN10 – Electrical Installer Theory Examination Marking Schedule

Notes:1. (1 mark) means that the preceding statement/answer earns 1 mark.

2. This schedule sets out the accepted answers to the examination questions. A marker can exercise their discretion and decide on the overall accuracy of any answer that is presented in the candidate's own words.

Question 1	<i>Reference Marks</i>	<i>Marking notes</i>
(a) • To prevent the star and delta contactors closing simultaneously • Causing a short-circuit.	(1 mark) (1 mark)	
(b) (i) To increase the starting torque (ii) To discharge a large capacitor	(1 mark) (1 mark)	
(c) (i) The prospective short-circuit current of the installation (ii) Any ONE of: • Earth leakage current in the circuit. • Earth leakage current in the appliance. • An imbalance in current between phase and neutral • A neutral to earth connection has occurred	(1 mark) (1 mark)	
(d) (i) This is the time it takes the fuse to interrupt the current flow (ii) This is the maximum current the fuse is designed to carry without operating.	(1 mark) (1 mark)	
(e) Any ONE of: • Parallel path to the star point at the distribution transformer • Ties the voltage between phase and earth to 230V (standard low voltage) • Minimises the potential difference between neutral and earth	(2 marks)	

Question 2	<i>Reference Marks</i>	<i>Marking notes</i>
(a) <ul style="list-style-type: none"> • To ensure that the test meter/instrument operates correctly during the procedure. • To ensure that the circuit has been isolated before it is worked on. 	(1 mark) (1 mark)	
(b) (i) Means that the electricity ceases to be supplied to the equipment. (ii) <ul style="list-style-type: none"> • Means the equipment has been deliberately disconnected from the electricity supply • And precautions have been taken to prevent reconnection of the supply to the equipment. 	(1 mark) (1 mark) (1 mark)	
(c) Any TWO of: <ul style="list-style-type: none"> • Attach an out-of-service tag to the isolator. • Protect the cables to prevent damage • Take steps to prevent access to the cables. 	(2 marks)	
(d) Any THREE of: <ul style="list-style-type: none"> • Lock open the isolating switch for the machine. • Lock the machine MCBs in the off position. • Use an access permit or "hold card" system. • Disconnect the final subcircuit supplying the machine 	(3 marks)	

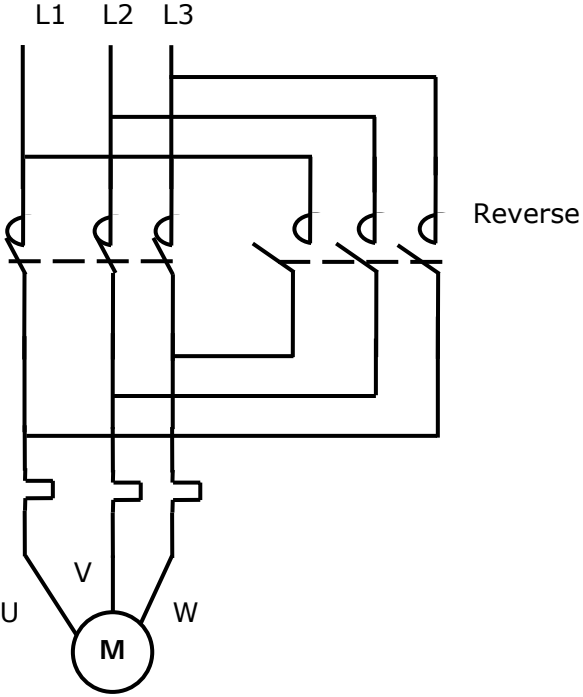
Question 3	Reference Marks	Marking notes
(a) (i) 30 milliamps. (ii) 10 milliamps (iii) 300 milliamps.	(1 mark) (1 mark) (1 mark)	
(b) • Because the RCD trips in milliseconds • Before physiological harm can occur	(1 mark) (1 mark)	
(c) • The short circuit does not produce an imbalance between the phase and neutral currents • Therefore is not detected by the RCCB.	(1 mark) (1 mark)	
(d) • To ensure that the PRCD trips when supply is lost • And that it must be manually reset to restore supply.	(1 mark) (1 mark)	
(e) Yes The RCD detects the imbalance regardless of the polarity of the supply.	(½ mark) (½ mark)	

Question 4	Reference Marks	Marking notes
(a) (1) Earth continuity test (2) Insulation resistance test	(1/2 mark) (1/2 mark)	
(b) Test 1 <ul style="list-style-type: none"> • Ohms function • Any ONE of: <ul style="list-style-type: none"> * Lowest range * Auto-range • Test between the PEC conductor of the flexible cord and the frame of the motor • Result of a lot less than 1 ohm 	(1/2 mark) (1/2 mark) (1 mark) (1 mark)	Parts (b) and (c) are in the order stated in (a)
(c) Test 2 <ul style="list-style-type: none"> • Mohms scale • Mohms range • 500V d.c. range • Test between each conductor of the flexible cord and the frame of the motor • Result of more than 1 Mohm 	(1/2 mark) (1/2 mark) (1/2 mark) (1 mark) (1/2 mark)	
(d) <ul style="list-style-type: none"> • Ohms function • Lowest range • Test between the frame of the motor and a known earth other than the motor circuit • Low enough to ensure the protective device operates 	(1/2 mark) (1/2 mark) (1 mark) (1 mark)	

Question 5	Reference Marks	Marking notes
<p>(a) (i) $V_s = \frac{N_s \times V_p}{N_p}$ $= \frac{1 \times 11000}{47.8}$ $= 230.13V$</p> <p>(ii) $V_1 = V_{ph} \times \sqrt{3}$ $= 230 \times \sqrt{3}$ $= 398.6V$</p> <p>(iii) $I_L = \frac{VA}{(V_1 \times \sqrt{3})}$ $= \frac{150000}{11000 \times \sqrt{3}}$ $= 7.87A$</p> <p>(iv) $I_L = \frac{VA}{(V_1 \times \sqrt{3})}$ $= \frac{150000}{398.6 \times \sqrt{3}}$ $= 217.27A$</p>	<p>(1/2 mark)</p> <p>(1/2 mark)</p> <p>(1 mark)</p> <p>(1/2 mark)</p> <p>(1/2 mark)</p> <p>(1 mark)</p> <p>(1/2 mark)</p> <p>(1/2 mark)</p> <p>(1 mark)</p>	<p>For (a) the use of 230V and 400V is acceptable</p>
(b) VA or kVA	(1 mark)	
(c) Any TWO of:	(1 mark)	
<ul style="list-style-type: none"> • star – star • star – delta • delta – star • delta - delta 		

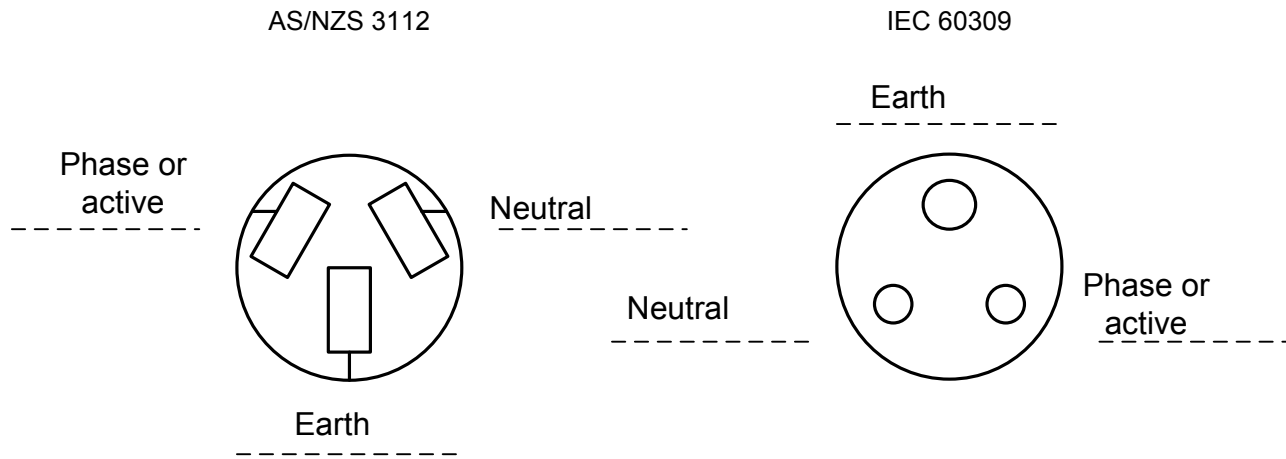
Question 6	Marks		Reference
(a) $I_{\text{load}} = \frac{P}{V}$ $= \frac{6000}{230}$ $= 26.1\text{A}$ $I_{\text{fault}} = \frac{V}{R}$ $= \frac{230}{(6 + 0.38)}$ $= 36\text{A}$ $I_{\text{total}} = I_{\text{load}} + I_{\text{fault}}$ $= 26.1 + 36$ $= 62.1\text{A}$	(½ mark) (½ mark) (1 mark) (½ mark) (½ mark) (1 mark) (1 mark) (½ mark) (1 mark)		
(b) 250 s	(1 mark)		
(c) Vd across protective earthing conductor equals touch voltage $V_{dE} = I \times R$ $= 62.1 \times 0.28$ $= 17.59\text{V}$ No touch voltage hazard exists	(½ mark) (1 mark) (1 mark)		

Question 7	Reference Marks	Marking notes
(a) <ul style="list-style-type: none"> • Rewireable fuses have inaccurate operating characteristics. • And will generally not operate within required time limits 	(1 mark) (1 mark)	
(b) <ul style="list-style-type: none"> • Gg HRC fuses and MCBs have accurate operating characteristics • That ensures they operate with required time limits 	(1 mark) (1 mark)	
(c) When an overload occurs the HRC fuses will generally take longer to operate than the thermal overloads	(1 mark)	
(d) <ul style="list-style-type: none"> • Higher kA rating • Speed of operation 	(½ mark) (½ mark)	
(e) <ul style="list-style-type: none"> • The rupturing capacity of the MCB is too small for the PSSC of the installation. • The HRC fuses provide the correct rupturing capacity for the installation 	(1 mark) (1 mark)	
(f) Only the protective device electrically closest to the fault operates.	(2 marks)	

Question 8	Reference Marks	Marking notes
<p>(a)</p>  <ul style="list-style-type: none"> • Correct forward circuit • Correct reverse circuit • Overload protects motor in both directions • Working circuit 	<p>(1 mark)</p> <p>(1 mark)</p> <p>(1 mark)</p> <p>(2 marks)</p>	
<p>(b) (i) $I \text{ in star} = I \text{ DOL} \times 0.33$ $= 90 \times 0.33$ $= 30\text{A}$</p> <p>(ii) $\text{FLT DOL} \times 0.8^2$ $= 200 \times 0.64$ $= 128\%$</p>	<p>(½ mark)</p> <p>(½ mark)</p> <p>(1 mark)</p> <p>(½ mark)</p> <p>(½ mark)</p> <p>(1 mark)</p>	
<p>(c) Is the length of time taken for a motor to change speed from rest to full speed.</p>	<p>(1 mark)</p>	<p>Alternatively, the answer can be expressed as the time taken to develop full load torque</p>

Question 9	Marks	Reference	Marking notes
(a) AS/NZS 3000	(1 mark)		

(b)



<ul style="list-style-type: none"> Correct polarity on AS/NZS 3112 	(1½ marks)		To gain marks the polarity must be completely correct
<ul style="list-style-type: none"> Correct polarity on IEC 60309 	(1½ marks)		To gain marks the polarity must be completely correct
(c) (i) A-N 0V	(1½ marks)		To gain marks the polarity must be completely correct
A-E 0V			
N-E 0V			
(ii) A-N 230V	(1½ marks)		To gain marks the polarity must be completely correct
A-E 230V			
N-E 0V			

Question 9	<i>Marks</i>	<i>Reference</i>	<i>Marking notes</i>
(d) Any TWO of: <ul style="list-style-type: none"> • The protective earthing conductor is open-circuited. • There is no earth to the socket outlet • The earth terminal is broken. 	(2 marks)		
(e) Active and neutral are transposed (in the final subcircuit or socket outlet).	(1 mark)		