0171-38 Level 3 Advanced Technical Extended Diploma in Land-Based Engineering (1080)

0171-018/518 Level 3 Land-Based Engineering – Theory Exam (2)

March 2022 Mark Scheme

Q no.	Acceptable answer(s)	Guidance	Max mks	Ref
Q1	**One** mark per type of chain to a maximum of **four** marks. • Roller chain (1). • Silent chain (1). • Leaf chain (1). • Link chain (1). • Detachable chain (1). • Flat-top chain (1). • Engineering steel chain (1). • Pintle chain (1). • Duplex chain (1). • Extended pitch chain (1).	Allow any other technically correct term for a drive chain. Do not accept application eg timing chain.	4	358 1.1 AO1
Q2	Up to **two** marks per advantage to a maximum of **six** marks. • No slippage/ can transmit higher torque (1) because of positive drive (1). • Can operate in adverse conditions (1) because it is not altered by temperature/ atmospheric conditions (dust, moisture) (1). • More compact (1) due to increased power to weight ratio (1). • Increased life span/ longer service periods (1) because they are harder wearing/ less liable to stretch (1). • Lower fire hazard risk (1) because of steal construction (1).		6	358 1.1 AO2
Q3	**One** mark per cause per symptom to a maximum of **five** marks: Symptom | Cause	Accept any other relevant point.	5	358 1.1 1.2 AO2

	<table><tr><td>Rapid side wall wear</td><td>• Belts rubbing guard (1) • Worn or damaged sheaves (1) • Sheaves misaligned (1) • Insufficient tension (1) • Wrong belt cross-section or type (1) • Faulty variable (speed) pulleys (1) • Improper or prolonged storage (1) • Excessive heat (1) • Excessive oil or grease (1) • Use of belt dressing (1) • Abrasive environment (1) • Excessive moisture (1) • Inappropriate sheave material (1) • Improper tensioned idler (1)</td></tr><tr><td>Belt soft, swollen</td><td>• Excessive exposure to oil or grease (1) • Use of belt dressing (1)</td></tr><tr><td>Belt slips, squeals</td><td>• Worn or damaged sheaves (1) • Insufficient tension (1) • Wrong belt cross-section or type (1) • Excessive oil or grease (1) • Excessive moisture (1) • Overload drive-underbelting (1) • Insufficient wrap (on small sheave) (1)</td></tr><tr><td>Underside cracked</td><td>• Excessive heat (1) • Sheaves too small (1) • Undersized backside idler (1) • Improperly positioned backside idler (1) • Sheaves misaligned (1) • Improper/prolonged storage (1)</td></tr><tr><td>Belt cover split</td><td>• Belts pried on/misplaced slack (1) • Foreign objects in grooves (1)</td></tr></table>			
Q4	**One** mark per measurement to a maximum of **four** marks. • End float (1). • Backlash (1). • Rolling resistance (1). • Teeth penetration (1).	Accept any other suitable correct answer.	4	359 1.1 AO1
Q5 a)	Power enters the transmission through the input shaft/first motion shaft (1) and rotates the layshaft/countershaft via the constant mesh gears (1). The layshaft/countershaft gears mesh with gears on the main shaft/output shaft (1). These gears rotate round the mainshaft/output shaft (1). The synchro unit is splined to mainshaft/output shaft (1), power	Accept any other suitable correct wording. Allow acceptable terminology	6	359 1.1 AO2

	flows through the rotating gears to the synchro and then on to mainshaft/output shaft(1).			
Q5 b)	By measuring the clearance (1), between the blocker ring and the gear face (1), reduced clearance is caused by blocker ring wear (1).	Accept any other suitable correct wording.	3	359 1.1 AO2
Q6	Non disengagement of drive (1), causing grinding of gears /difficulty changing gear/low biting point (1).	Accept any other suitable correct wording.	2	359 1.2 AO2
Q7	**One** mark per component to a maximum of **four** marks. • Friction plate/clutch plate (1). • Separator plate/steel plate/plain plate (1). • Bellville spring (1). • Piston seals (1). • Clutch separator spring(s) (1).	Accept any other relevant point.	4	360 1.1 AO2
Q8	**Two** marks per reason to a maximum of **six** marks. • To set clutch engagement point (1), in order for consistent/predictable operational feel (for operator) (1). • To set fill time (1), in order to control engagement aggressiveness/modulation (1). • To allow for clutch wear and/or internal oil leakage (1), while maintaining consistent performance (1). • To programme the ECU (electronic control unit) with data/parameters (1) to: ○ recognise the minimum/empty and maximum/full points of the clutch-packs (1). **or** ○ recognise the fully open and fully closed position of the PWM (pulse width modulated) valve (1).	Accept any other suitable correct wording. Two marks maximum relating to programming an ECU.	6	360 1.1 AO2
Q9	**Two** marks per advantage to a maximum of **four** marks. • The displacement pump/motor can be adjusted (1), meaning the output speed can be varied (1). • Output torque and power are (infinitely) variable (across range in both directions of rotation) (1), meaning the widest operating range of any hydrostatic drive/available optimum efficiency can be achieved (1).	Accept any other suitable correct wording.	4	361 1.1 AO2
Q10	• Flow of oil to motor to controls rotational speed of the epicyclic ring gear (1). • Angle of swash (of the pump and/or the motor) controls the rotation on the ring gear (1). • Reduction in angle of swash increases resistance on ring gear (1). • Slows down ring gear allowing drive to progressively transfer to fully mechanical (1).	Accept any other suitable correct wording.	4	361 1.2 AO2

Q11	For no awardable content, award 0 marks. **Band 1 (1-4 marks)** The candidate will provide a limited discussion demonstrating little or no understanding of the diagnostic process. They will demonstrate minimal depth of knowledge. Vague links will be made in the diagnostic process or to possible faults. There will be no analysis of findings and results. To access the higher marks in the band, candidates may attempt to order their response in a logical manner with limited success showing some attention to detail. If included, analysis will be brief. **Band 2 (5-8 marks)** The candidate will provide a detailed discussion demonstrating some understanding of the diagnostic process with some range and depth. There will be some clear links made in the diagnostic process and to the possible faults. There will be some analysis of findings and results. To access the higher marks in the band, candidates may attempt to order their response in a logical manner with some success, showing clear attention to detail. Analysis of results will be structured. **Band 3 (9-12 marks)** The candidate will provide a comprehensive discussion demonstrating a thorough understanding of the process with an extensive range and depth. There will be clear and relevant links made in the diagnostic process and to possible faults. There will be strong analysis of findings and results. To access the higher marks in the band, candidates will order their response in a logical manner successfully with focus, and comprehensive attention to detail. The analysis of results will be thorough, detailed, and accurate.	Indicative content: • Health and Safety • Diagnostic Checks • Analyse Results • Summary of findings	12	AO4