ASSESSMENT MAPPING

Table A – III / 7
Specification of minimum standard of competence for electro-technical ratings

Guidance Notes (Scoring)	
Terms	**Description**
Award	**Bonus points, an integer within the range of 0 to 100. The default value is 0.**
Penalty	**Penalty points, an integer within the range of 0 to 100. The default value is 0.**
Single	**A rule is triggered in the scenario only once: the first time the conditions occur.**
Circular	**A rule is triggered every time the conditions occur.**
Time	**Time dependency ruling**
Weight	**Multiplier of a trainee's level of competency**
Levels of Simulation	
Familiarization	Familiar with the equipment, layout procedures, and routine task.
Operational	The task relates to the inputs and outputs and their relationship and has to do with the performance of a function.
Functional	The task relates to the functions or activities performed by the system without reference to which of the elements of the system perform those functions.
Management	Relates to the management of the combination of systems to perform a given job.
Communication	Relates to effective communication between human resources to report, get feedback, or to execute a task.
Emergency	Task performed in circumstances where there is variation or deviation from an expected scenario or situation.
Crisis	Task performed when the emergency has developed into a crisis.

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
Function 1: Electrical, electronic and control engineering at the support level							
C1 **Safe use of electrical equipment**	Safe use and operation of electrical equipment, including: .1 Safety precautions before commencing work or repair .2 Isolation procedures .3 Emergency procedures .4 Different voltages on board Knowledge of the causes of electric shock and precautions to be	Perform lockout/ tag-out of electrical equipment using proper electrical tools and instruments and explain emergency procedures in case of electric shock in accordance with established procedures	Safe working practices are observed and appropriate equipment is used in performing lockout/ tag-out and isolation procedures	• Choose of suitable PPE appropriate to the tasks (*applied for all the tasks)*: ∗ coverall ∗ safety helmet ∗ gloves ∗ safety glasses ∗ safety shoes Lockout/tag-out procedure: • request for electrical work permit and risk assessment • inform the immediate officer • shut down or switch off power source • isolate equipment from any source of power and lockout through individual locks • push the start button to make sure certain equipment will not start	Checklist	Operational Emergency Crisis	Laboratory

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
	observed to prevent shock			tag the equipment using signage such as “DO NOT OPERATE MEN AT WORK” * sample electrical work permit and risk assessment Actual equipment: * lockout and tag-out kit including signage * Electrical circuit board or starter panel Circuit breaker OR fuse box with fuse and puller			
			Selections and use of use tools and equipment is appropriate in understanding safe voltages for hand-held equipment	• measure the circuit voltage using multi-tester or multimeter • tools and equipment in lockout/tag-out and isolation are used correctly Actual equipment: * multimeter or multi-tester * tools and equipment for lockout/tag-out battery (12 VDC)			

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
			Understand risks associated with high-voltage equipment and onboard work, and actions in the event of electrical shock in accordance with safety practices	The candidate shall identify the risk of the following different voltages used onboard: • voltage relative to currents: ∗ 24 VDC – slight sensation to painful caused by electric shock ∗ 110-440 VAC – painful to severe pain with heart fibrillation and can cause burn and can be fatal high voltage relative to currents: ∗ 1000 VAC or more – arcing, arc blast which can caused burn, electric shock and eventually fatal Familiar on the action in the event of electrical shock: ∗ De-energize the live circuit by switching off the power source			

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
				* Protect yourself by insulator or insulated materials * Remove the victim from the shock hazard area using non- conductive materials such as safety hook * Apply first aid for electric shock and burn. Ship's poster for different voltages and actions to be taken in case of electrical incident (***at least 2x1 meters in dimension***) * Electrical First Aid Kit * Rubber matting			

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
2 Contribute to monitoring of the operation of electrical systems and machinery	Basic knowledge of the operation of mechanical engineering systems, including: .1 Prime movers, including main propulsion plant .2 Engine-room auxiliary machineries .3 Steering systems .4Cargo-handling systems .5 Deck machineries .6 Hotel systems	The candidate must be able to assist to the monitoring the operation of electrical systems and machinery in accordance with shipboard safety practices	Knowledge that ensures operations of equipment and system is in accordance with operating manuals and performance levels are in accordance with technical specifications.	The candidate shall be able to and complete log sheets as applicable: 1. Identifies the operational parameters of electrical systems and equipment associated with the propulsion plant and should be in the normal range as per operating manual; • (*Samples of electrical parameters associated with propulsion system either actual equipment or simulator)* 2. Identifies the operational parameters of auxiliary machinery and equipment associated with a propulsion plant that must be monitored and should be in the normal range as per operating	Checklist	Operational	Engine Simulator:

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
				manual; • (*Samples of electrical parameters associated with engine-room auxiliary machineries either actual equipment or simulator)* 3. Identifies the operational parameters of vessel steering machinery that must be monitored and should be in the normal range as per operating manual; • (*Samples of electrical parameters associated with steering systems either actual equipment or simulator)* 4. Identifies the operational parameters of vessel cargo handling machinery and			

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
	Basic knowledge of: .1 Electro-technology and electrical machines theory .2 Electrical power distribution boards and electrical equipment .3 fundamentals of automation, automatic control systems & technology .4 instrumentations,			equipment that must be monitored and should be in the normal range as per operating manual; • (*Samples of electrical parameters associated with cargo handling systems and machinery either actual equipment or simulator)* 5. Identifies the operational parameters of vessel deck machinery and equipment that must be monitored and should be in the normal range as per operating manual; • (*Samples of electrical parameters associated with deck machineries either actual equipment or*			

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	alarm & monitoring systems .5 Electrical drives .6 electro-hydraulic & electro-pneumatic control systems .7 Coupling, load sharing and changes in electrical configuration			*simulator)* 6. Identifies the operational parameters of vessel hotel machinery and equipment that must be monitored and should be in the normal range as per operating manual; • (*Samples of electrical parameters associated with hotel systems either actual equipment or simulator)* As per the task above, the candidate shall: 1. Identify the Electro-technology and electrical machines (*at least 3 items*) 2. Identify the Electrical power distribution			

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				boards and electrical equipment (*at least 3 items*) 3. Identify the Automation and control systems (*at least 3 items*) 4. Identify the Instrumentation, alarm and monitoring systems (*at least 3 items*) 5. Identify/Name Electrical drives commonly used on board (*at least 3 items*) 6. Identify the Generator coupling and load sharing requirements (*at least 3 items*) 7. Connect and detect faults in basic electro-hydraulic and electro-pneumatic control system			

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
				8. Check the technical specifications of shipboard electrical engineering systems			

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C3 **Use hand tools, electrical and electronic measurement equipment for fault finding, maintenance and repair operations**	Safety requirements for Working on shipboard electrical systems Application of safe working practices *Basic knowledge of*: .1 Construction and operational characteristics of shipboard AC and DC systems and equipment .2 Use of measuring instruments, machine tools, and hand and power tools	Candidate must be able to perform safe use hand tools, electrical and electronic measurement equipment for fault finding, maintenance and repair operation in accordance with shipboard safe working practices	Satisfactorily Implement safety procedures Selection of procedures for the conduct of repair and maintenance is in accordance with manuals and good practice Selection and use of test equipment are appropriate and interpretation of results is accurate	• As per (**C1**) Task, performed lock-out/tag-out procedures and follow electrical work procedure (electrical work permit) • Explain differences between construction and operational characteristics of AC and DC systems and give sample equipment for each system. • Check winding resistance of the three-phase motor using appropriate measuring device (*correct unit and value*) • Check insulation resistance of a 3 phase, 6 leads motor using appropriate measuring equipment (*correct unit and value*) * Winding to winding * Winding to Ground or Earth	Checklist	Operational Communication	Laboratory

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
				• Measure the running current of the three-phase motor *(with correct unit and value)* • Measure the running line to line voltage of the three-phase motor *(with correct unit and value)* Actual Equipment/tools to be used: 1. Cover all 2. Safety Helmet 3. Safety shoes 4. Gloves 5. Lock Out/ Tag Out Checklist 6. Electrical Work Permit Checklist 7. Electrical hand-held equipment including: • DMM/ Digital VOM • Analog Multimeter • clamp meter • Insulation Resistance Tester			

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Function 2: Maintenance and repair at the support level							
C4 Contribute to shipboard maintenance and repair	Ability to use lubrication and cleaning materials and equipment Knowledge of safe disposal of waste materials Ability to understand and execute routine maintenance and repair procedures Understanding manufacturer's safety guidelines and shipboard instructions	Candidate must be able to contribute to shipboard maintenance and repair in accordance with shipboard safety practices and procedures	Maintenance activities are carried out in accordance with technical, safety and procedural specifications Selection and use of equipment and tools are appropriate	• Check that Lock-out/Tag-out Checklist is filled out and done as per task in (**C1**) • Sections of Electrical Work Permit is filled out: ∗ General Section ∗ Work Planning or Risk Assessment ∗ Isolation Log ∗ Completion Section • Electrical tools and equipment are properly used as per task in (**C3**)	Checklist	Operational Communication	Laboratory

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
			Use lubrication and cleaning maintenance and repair works are carried out in accordance with technical, safety and procedural specifications Dispose waste materials in a safe manner in accordance with the manufacturer's safety and technical specifications	• Choose the suitable lubricants as per vessel's lubrication chart and in accordance with the manufacturer's recommendation • Preparation of materials using rags, contact cleaner and grease with special considerations in materials safety data sheet (MSDS) • Proper disposal of waste materials used on the task at hand and disposal of electrical consumables as per national or international legislation Actual Equipment/tools to be used: 1. Cover all 2. Safety Helmet 3. Safety shoes 4. Gloves 5. Filled out Lock Out/ Tag Out Checklist	Checklist		

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
				6. Filled out Electrical Work Permit 7. Electrical hand-held equipment including: • DMM/ Digital VOM • Analog Multimeter • Clamp meter • Insulation Resistance Tester 8. Sample ship's Lubrication Chart 9. National or international Waste disposal arrangements 10. MSDS of grease and contact cleaner			

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
C5 Contribute to the maintenance and repair of electrical systems and machinery on board	Basic knowledge of electro-technical drawings and safe isolation of equipment and associated systems required before personnel are permitted to work on such plant or equipment Test, detect faults and maintain and restore electrical control equipment and machinery to operating condition Electrical and electronic equipment operating in flammable areas Carrying out safe maintenance and repair procedures Detection of	Candidate must be able to perform safe maintenance and repair of electrical systems and machinery on in accordance with manufacturer safety guidelines and shipboard instructions	The effect of malfunction on associated plant and systems is accurately identified, ship's technical drawings are correctly interpreted, measuring and calibrating instruments are correctly used and actions taken are justified. Isolation, dismantling and reassembly of plant and equipment is in accordance with manufacturer's safety guidelines and shipboard instructions	The candidate shall be able to: 1. Identifies risks associated with the maintenance or repair work of electrical systems and machinery (*as identified in the risk assessment*) 2. Uses ship's technical drawings and schematics. Interpret electrical diagram and identify the type of electro-technical drawing– schematics for power systems, electrical, electronics, pneumatics, hydraulics, instrumentation, or automation (*applied in C2*) 3. Perform fault finding on electrical circuits and restoration to operating condition as per manufacturer's safety guidelines (*applied in C2)* 4. Selects and correctly uses appropriate measuring, calibrating, and test	Checklist	Operational Communication	Laboratory

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
	machinery malfunction, location of faults and action to prevent damage Maintenance and repair of lighting fixtures and supply systems			instruments. *(as done in C3*) 5. Identify electrical equipment or hazardous areas (*enumerate at least 3*) 6. Perform testing of fire detector / sensor (*smoke or heat*) using actual instruments 7. Identify malfunctions on electrical systems or machinery. *(applied in C2)* 8. Testing, maintenance and repair of lighting fixtures and supply systems and rectify fault in basic lighting circuit (*fluorescent circuit that includes the following: ballast, condenser, starter*) Actual Equipment/tools to be used: 1. Cover all 2. Safety Helmet 3. Safety shoes 4. Gloves			

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
				5. Actual or equivalent sample of Electro-technical drawings 6. Functional Fire detector or sensor 7. Testing equipment for fire detector or sensor (*such as smoke or heat*) Fluorescent Circuit with ballast, condenser and starter system			

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Function 3: Controlling the operation of the ship and care for persons on board at the support level							
C6 Contribute to the handling of stores	Knowledge of procedures for safe handling, stowage and securing of stores	Demonstrate procedures for safe handling, stowage and securing of stores	Handling of dangerous, hazardous and harmful stores is carried out in accordance with established safety practices and equipment operating instructions	Given the sample stores, keep them according to their compatibility in special consideration with material safety data sheet (MSDS): • Bar Soap • Paint • Muriatic acid • Alcohol • Bolts and nuts • Lotions • Food products • Bleach • Kerosene	Checklist	Operational Emergency Communication	Laboratory
			Stowage and securing of heavy equipment are carried out in accordance with safety practices	* secure heavy equipment in place using rope or sling to prevent rolling during bad weather. * Check the tightness of the rope and stability of the equipment			
			Communications within the operator's area of responsibility are successful and to	Actual materials or replica with corresponding MSDS: * Bar soap			

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
			demonstrate correct lifting technique and method to prevent back injury in accordance with established safety practices	* Paint * Muriatic Acid * Alcohol * Bolts and nuts * Lotions * Food products * Bleach * Kerosene *Sample or replica of heavy equipment ropes or slings			
C7 **Apply precautions and contribute to the prevention of pollution of the marine environment**	Knowledge of the precautions to be taken to prevent pollution of the marine environment Knowledge of the use and operation of anti-pollution equipment Knowledge of approved methods for disposal of marine pollutants	Identify different MARPOL annexes and apply knowledge to be taken to prevent marine pollution and use anti-pollution equipment	Procedures designed to safeguard personnel and the ship are observed at all times through knowledge of different Annexes of MARPOL and anti-pollution equipment fitted onboard	The candidate shall enumerate all the Annexes of MARPOL and give brief description: • **Annex I** – Regulation for the prevention of pollution by OIL • **Annex II** - Regulation for the prevention of pollution by Noxious Liquid Substances in Bulk • **Annex III** - Regulation for the prevention of pollution by Harmful Substances Carried by Sea in Package Form • **Annex IV** - Regulation for the	Checklist	Operational Emergency Communication	Laboratory Marine Pollution Equipment and/or Training (MARPO)L

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
				prevention of pollution by Sewage from ships • **Annex V** – Regulation for the prevention of pollution by Garbage from Ships • **Annex VI** - Regulation for the prevention of Air pollution from ships Enumerate and give a brief description of the different anti-pollution equipment fitted onboard: • **Oily water separator** (**OWS**) – it is used to separate oil and water mixtures into their separate components with continuous oil monitoring device for maximum 15 ppm content. • **Sewage treatment plant** – it is used to process raw sewage from ships in order to be discharge legally in the sea			

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				• **Oil Discharge Monitoring Equipment (ODME)**– used to prevent the pollution of ocean by oil by measuring oil content in the ballast and slop water. Equipment/Tools to be used: Posters of Cut-away view or system lay-out of the following equipment (***at least 2x1 meters in dimension***): * Oily water separator * Sewage treatment plant Oil Discharge Monitoring Equipment			
			Given the world map, SECA/ECA (Emission Control Area) is identified and located.	*Two -way radio * *Sample material to be lifted for demonstration Equipment/Tools to be used: World Map or similar equipment			

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
C8 **Apply occupational health and safety procedures**	Working knowledge of safe working practices and personal shipboard safety, including: 1. Electrical safety 2. Lockout/ tag-out 3. Mechanical safety 4. Permit to work systems 5. Working aloft 6. Working in enclosed spaces 7. Lifting techniques and methods of preventing back injury 8. Chemical and biohazard safety 9. Personal safety equipment	Identify and demonstrate safe working practices and personal shipboard safety in accordance with health and safety precautions	Safe working practice are observed through knowledge of different work permits system used onboard	Identify at least give 5 examples of work permits used onboard from the given set and give brief description and example: • **Hot work permit** – is required for work involving the use of a flame or other sources of ignition. Example: welding, flame cutting or grinding which produces sparks • **Electrical work permit** – is required for works on electrical systems where there is possibility of contacting energized conductor. Example: working of electric motors, work on instrumentation, instrument panel, reaching into any panels which may have energized • **Working aloft permit** – is required when personnel working above 2 meters in height above the deck. Example: working in a mast, lighting fixtures or any work that required safety harness.	Checklist	Operational Communication	Laboratory

Competence	KUP	Assessment Outcome	Performance Criteria	Performance Standard	Scoring Procedure	Level of Simulation	Methods of Assessment
				• **Enclosed space entry permit** – is required to allow personnel to enter a confined or enclosed space. Example: entry into tanks, void spaces and cofferdams • **Working outboard permit** – is required to allow personnel to work over the side of the ship. Example: working using bosun's chair in painting the side of the ship • **Small craft alongside permit** – is required when operations need to have a small craft alongside the vessel. Example: bunkering using barge or pilot through pilot boat. • **Underwater work permit** – is required when working underwater below or side of the keel. Example: inspection of rudder, propeller or fouling of the hull. • **Cold work permit** – is required for potentially hazardous work not covered			

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				by other types of work permits. Example: chemical cleaning, handling of hazardous substance, heavy lifts, erecting or dismantling scaffolds, machinery maintenance Sample work permits of the following: * Hot work * Electrical work * Working aloft * Enclosed space entry * Working outboard * Small craft alongside * Underwater work * Cold work permit			