

## **Electro-technical Officer (ETO) MCA Oral Examination Syllabus**

The principal objective of the oral examination is to ensure that a candidate will be able to undertake the duties and responsibilities of an ETO (O) on board a seagoing ship. In the examination every candidate must prove the ability to undertake the tasks, duties and responsibilities listed in the column 1 of table A-III/6 of STCW Code.

The syllabus indicated below is in compliance with the STCW requirements and is divided into topics. Each topic contains a group of tasks, duties and responsibilities for the operation, maintenance and repair of the electrical system and equipments considered necessary for the safe and efficient running of the ship, safety of life at sea or protection of the marine environment.

### **Electro-technical Officer Operational level STCW Convention regulation III/6**

All candidates **MUST** have the knowledge of the oral examination syllabus before taking oral examination with the MCA examiner.

#### **Topic- 1**

##### **Monitor the operation of the Electrical, Electronic and Control Systems**

- Basic understanding of the operation of mechanical engineering systems of the following:
  - Prime movers including emergency generators;
  - Main Propulsion Machinery;
  - Auxiliary Equipment;
  - Steering system;
  - Cargo handling systems /machinery;
  - Deck machinery;
  - Hotel systems.
- Knowledge of:
  - Electrical machines theory (construction, working principle and protection devices for Generator, Motor (including types and various starting methods) and Transformer);
  - Fundamentals of electronics and power electronics;
  - Electrical power distribution boards and electrical equipment;
  - Fundamentals of automation, automatic control systems;
  - Instrumentation , alarm and monitoring systems;
  - Electrical drives (including control unit and power modulator - converters (ac to dc, ac regulators, choppers or dc-dc converters, inverters, cycloconverters), variable impedance and switching circuits) ;
  - Technology of Electrical materials;
  - Electro-hydraulic and electro-pneumatic control systems; and
  - Appreciation of the hazards and precautions required for the operation of power systems above 1000 volts.

#### **Topic – 2**

##### **Monitor the operation of automatic control systems of propulsion and auxiliary machinery**

Knowledge, understanding and proficiency in the preparation of control systems of propulsion and auxiliary machinery, for operation and maintaining safe operating condition – alarms, auto change over (to stand by unit), shut down, lock out, slow down, safety interlocks.

### **Topic – 3**

#### **Operate Generators and distribution systems**

Knowledge, understanding and proficiency in coupling, load sharing, changing over generators, coupling and breaking connection between switchboards and distribution panels – ability to establish rules and procedures for safe operation in accordance with the operating manuals (maker) – ability to explain electrical distribution system with drawing/instructions – knowledge of earthing systems and earth fault finding procedures.

### **Topic – 4**

#### **Operate and Maintain Power Systems in excess of 1,000 Volts**

**Have Knowledge, understanding and proficiency in:**

- Safety precautions and procedures;
- Electrical propulsion of the ships;
- Electrical motors and control system;
- Safe operation and maintenance of high-voltage systems and the danger resulting from operational voltage of more than 1,000 volts.
- Legislation pertaining to high voltage (HV) systems;
- HV switchboards,
- Protection for HV feeder, motors and transformers;
- Permit to work and sanction to test;
- Compiling and implementing switching plan to isolate a HV distribution fault;
- Earthing procedures;
- Checking Circuit Breaker for correct operation;
- Pressure tests of Circuit Breaker;
- Polarisation Index test for HV transformers;
- Trending HV IR tests.

### **Topic – 5**

#### **Operate Computers and Computer Networks on Ships**

Have understanding of:

Main features of data processing;

- Construction and use of computer networks on ships; and
- Bridge based, engine room based and commercial computer use.
- Ability to check and handle the computer networks and computers correctly.

### **Topic – 6**

#### **Use of Internal Communication System**

Have Knowledge, Understanding and Proficiency regarding the operation of all internal communication systems on board.

## **Topic – 7**

### **Maintenance and Repair of Electrical and Electronic Equipment**

Have knowledge, understanding and proficiency in:

- The interpretation of electrical and electronic diagrams;
- Safety requirements for working on shipboard electrical systems, including safe isolation of electrical equipment before personnel are permitted to work on such equipment;
- Issuance and requirements for the permit to work document;
- Maintenance and repair of electrical system equipment, switchboards, electric motors, generators and DC electrical systems and equipment;
- Detection of electric mal function, location of faults and measures to prevent damage;
- The precautions while carrying out insulation test on equipment incorporated with electronic circuit and devices;
- Construction and operation of electrical testing and measuring equipment;
- The performance test, maintenance, fault finding and repair of fire detection system and equipment.
- Function and performance tests of the following;
- Monitoring system;
- Automatic control system;
- Protective devices.

## **Topic – 8**

### **Maintenance and Repair of automation and control systems of main propulsion and auxiliary machinery**

Have knowledge, understanding and proficiency in:

- Safe isolation of equipment and associated system before personnel are permitted to work on the plant or equipment;
- Safety and emergency procedures;
- Testing, maintenance, fault finding and repair;
- Interpreting technical drawing;
- The use of measuring and calibrating instruments;
- Making justifiable decision leads to the restoration of automation and control systems by the method most suitable and appropriate to the prevailing circumstances and conditions.

## **Topic - 9**

### **Maintenance and Repair of Bridge Navigation Equipment and Ship Communication Systems**

Have knowledge, understanding and proficiency in:

- The principles and maintenance procedures of Navigation equipment, internal and external communication systems;
- Detecting machinery malfunction, location of faults and action to prevent damage;
- Safe isolation procedures;
- Interpretation of ships technical drawing;
- Safe maintenance and repair procedures;
- Testing, maintenance, faultfinding and repair;

## **Topic – 10**

### **Maintenance and repair of electrical, electronic and control systems of deck machinery and cargo-handling equipment**

Have knowledge, understanding and proficiency in:

- Safe isolation of equipment and associated system before personnel are permitted to work on the plant or equipment;
- Safety and emergency procedures;
- Testing, maintenance, faultfinding and repair;
- Interpreting technical drawing;
- The use of measuring and calibrating instruments;
- Making justifiable decision leads to the restoration of deck machinery and cargo handling equipment by the method most suitable and appropriate to the prevailing circumstances and conditions.

## **Topic – 11**

### **Maintenance and repair of control and safety systems of hotel equipment**

Have knowledge, understanding and proficiency in:

- Detecting machinery malfunction, location of faults and action to prevent damage; safe isolation procedures of equipment and associated systems;
- Interpretation of ships technical drawing;
- Safe maintenance and repair procedures;
- Testing, maintenance, fault finding and repair.

## **Topic – 12**

### **General Electrical Safety**

Have knowledge of:

- The types of Electrical and Electronic equipment that can be fitted in hazardous areas; the precautions (in addition to proper isolation of electrical equipment and systems) for the maintenance and repair of equipment and systems located in hazardous area;
- The issuance of permit to work;
- The precautions while working on live or dead electrical equipment/systems;
- The appropriate PPE and tools used for the maintenance, testing and repair of electrical equipment and systems;
- The Battery room safety, safe maintenance and working procedures on batteries, appropriate PPE and tools.

## **Topic – 13**

### **Emergency Power Supply**

Have knowledge of:

- Emergency Switchboard, emergency power supply to the essential equipment and lighting circuits and pertaining regulations, Emergency generator connection interlock (main and emergency switchboards) and various starting methods;
- Testing and maintenance of the auto start system for the emergency generator in the event of main power failure;
- Battery bank and UPS – maintenance and testing procedures.

## Topic – 14

### Controlling the operation of the ship and care for persons on board at the operational level.

- **Ensure compliance with pollution prevention requirements.**

Knowledge of:

- The precautions to be taken to prevent pollution of the marine environment;
- Anti-pollution procedures and all associated equipment; and
- Importance of proactive measures to protect the marine environment.

- **Prevent, control and fight fire on board.**

Knowledge of:

- Organising fire drills;
- Classes and chemistry of fire;
- Fire-fighting systems;
- Actions to be taken in the event of fire, including fires involving oil systems;

- **Operate life-saving appliances.**

Knowledge of:

- Organising abandon ship drills; and
- Operation of survival craft and rescue boats, their launching appliances and arrangements and their equipment, including radio life-saving appliances, satellite EPIRBs, SARTs, immersion suits and thermal protection aids.

- **Apply medical first aid on board ship.**

Knowledge of:

- Practical application of medical guides;
- Effective actions in the case of accidents or illnesses those are likely to occur on board ship.

- **Application of leadership and teamworking skills**

Knowledge and ability to apply:

- Task and workload management;
- Effective resource management; and
- Decision making techniques.

- **Contribute to the safety of personnel and ship.**

Knowledge of:

- Personal Survival Technique;
- Fire prevention and ability to fight and extinguish fires;
- Elementary first aid; and
- Personal safety and social responsibilities.