AMMV22 MARINE ELECTRICAL TECHNOLOGY

UNIT-1 POWER DISTRIBUTION AND REGULATIONS

1.1 The marine environment- effects of inclination- Generators- Power supply commonly available- main switchboard- motor controls- emergency services

1.2 Emergency stop panel- ships auxillary services- load analysis- electrical diagrams

1.3 Inherent dangers and avoidance of disastrous consequences

1.4 Active and passive safety measures- Do's and Don'ts- Electric shock- first aid- conditions of shock risk- Selection of AC and DC generators for use on ships- merits and demerits- location and Installation of generator sets.

1.5 Requirements & Regulations- safe electrical equipment's for hazardous areas- American safety standards- common definitions

1.6 British and European standards- tanker installations- Installations Ashore- Indian Standards.

1.7 Systems of AC distribution- general concept – single, two and three phase systems with 2,3 and 4 wires- power distribution- general Distribution scheme

1.8 Specific systems for ship's service- tankers schemes- primary power bus- need for emergency power supply- method of supply- passenger and cargo vessels requirements

1.9 Shore supply –precautions to be taken while consuming shore supply

1.10 Arrangement to ensure proper phase supply- remote switches to ventilating fans- fuel pumps – lubricating oil pumps and purifiers.

UNIT-2 INSTRUMENTATION AND SWITCHGEAR

2.1 Insulated & Earthed neutral systems- introduction- circuit faults- causes- prevention- earth fault indicators- detection and clearance- alternators.

2.2 AVR: excitation systems- carbon pile regulator- vibrating contact and static automatic regulator- transient voltage dip and alternator response- effect of kW and Kvar Loading.

2.3 Panel instrumentation: Introduction – system terminology

2.4 Phase sequence indicators. Paralleling of Alternators: Manual and auto synchronizing-

2.5 Lamps- parallel operation- excitation and throttle control- load sharing- kW, kVAR and Manual.

2.6 Switchboards & Switchgear: Main and sub switchboard-Rating and Characteristics of Main switchboards- group starter boards- distribution Fuse boards – bus bars

2.7 Instrumentation & controls- circuit breakers- alternator CBs- MCCB's- miniature CB's RCCB's- arc fault Current Interrupts- fused Isolators- fault protection devices

2.8 Introduction- over-voltage-surge transients- ripple- spikes- DC generator protection- alternator and system protection.

2.9 Protection through fuses- protection Discrimination Motor Protection.

UNIT-3 CABLES AND LIGHTING SYSTEMS

3.1 Electrical Cables: Cables- conductors- Wire Sizes- Current Rating- Testing-codes- Practical tips.

3.2 Insulation- protection and temperature ratings- insulation classes- A, B, E, F,H Insulation for High temperatures- Insulating Materials.

3.3 Cable insulation & Sheath- Cable gland- Degrees of Protection- Temperature Ratings- Temperature Rise- Determination of hot temperature.
3.4 Lighting Systems: Introduction- Incandescent Lamps- Discharge lamps- HCLPMF lamps- High pressure Mercury Fluorescent lamps
3.5 High and Low pressure sodium vapour lamps- Lamp caps- Effect of voltage on lamp performance- Navigation & signal lights
3.6 Signals for a power driven ship under way (At night)- Emergency lighting- Requirement of lighting of Deck and pump house of oil tankers.
3.7 Alarm Indication Systems: Fire alarms and Detection- Heat detectors- Smoke detectors- Combustion detectors- Miscellaneous alarm indicator systems
3.8 Scanning type system- Sequential starting and cut outs for an automatic fired boiler incorporating safety devices and combustion control equipment's- incinerators- Sewage plants- Bilge oil separators.

UNIT-4 PROPULSION AND STEERING SYSTEMS

4.1 Propulsion Systems: Auxiliary propulsion systems
4.2 Layout and Optimizing storage space- Electrical Propulsion- Advantages & Disadvantages
4.3 DC constant current systems- DC motor supplied from alternators- Turbo- electric propulsion- AC single speed and Induction motor drives- Fixed speed alternators- Cycloconverter device
4.4 Diesel Electric propulsion- Thruster and Water jet propulsion.
4.5 Steering Systems & Gyrocompasses: Fundamentals- Auto Navy steering Systems- Type P- Electro hydraulic Steering- Control systems-Typical system configuration
4.6 Components-Auto Steer Types, Structure- Gyroscopes- Compass Considerations.
4.7 Deck Machinery & Cargo Equipment: Anchor Windlass- Cargo winches- Hydra lift Marine cranes-Maritime GMC A.S. Hagglunds Drives & H.W.
4.8 Carlsen AB-Magnetic disc brakes.
4.9 Automation of Air Compressors: Selection- Choice of a correct machine-Oil-free and non-oil free air- Instrument air- Air Vs Water cooled
4.10 Reciprocating Compressors-Starting & control-Safety protection Equipment- Automatic Operation.

UNIT-5 AUXILLARIES AND MAINTENANCE

5.1 Batteries & Battery charging: Battery supplies- Lead-acid batteries-
5.2 Electrical Characteristics- Nickel- Cadmium batteries- Sealed Ni-Cd batteries
5.3 Battery charging- Charging from AC and DC mains- Standby Emergency batteries
5.4 Voltage Regulators- Battery insulation & safety measures
5.5 First Aid treatment- Rotary generators.
5.6 Gas analysers- Combustible gas indicator- Portable oxygen analyzer- CO_2 Analysis- Tank scope – Fixed oxygen Analyser.
5.7 Miscellaneous Systems: Cathodic protection system-Crankcase oil mist detector- Air drier- Dynic Water purity meter
5.8 Salinometer- Electric Tachometer- Rudder position Indicator
5.9 Ship's roll stabilizer – Galley Equipment- Laundry Equipment- Refrigerating Machinery

5.10 Temperature monitoring for R & AC systems.
5.11 Maintenance & Troubleshooting: Introduction- Planned Preventive Maintenance-
5.12 Life, Breakdown and Condition maintenance, Troubleshooting,
5.13 Maintenance of specific equipment's – Recommended list of spares, tools & Accessories.

References Books:

1. Elstan.A. Fernandez., "Marine Electrical Technology", 1st Edition, "Sterling Book House", Mumbai, 2002.
2. Elstan.A. Fernandez., "Marine Electrical Technology", 4th Edition, "Shroff Publishers & Distributors Pvt. Ltd.,Mumbai, 2007.
3. Surinder Pal Bali," Electrical Technology Machines and Measurements", Vol II, 1st Ed. Pearson, 2013.