

SYLLABUS FOR DIESEL MECHANIC

The candidate should have a good knowledge of the items listed below. He will be examined orally ; Passing marks 50%.

- (1) *Basic Principles of Diesel Engine* :— Timing Diagrams of 2-stroke and 4-stroke engine.
- (2) Name and function of various parts fitted on a Diesel Engine.
- (3) Practical knowledge in respect of overhauling of Diesel Engines including renewal of pistons and liners, adjustment of bearings and valve timings.
- (4) Operation of Fuel Pump, Fuel valves, Governors and other auxiliaries connected directly.
- (5) Lubrication, fuel, starting, scavenging and cooling systems of Diesel Engines.

SYLLABUS FOR ELECTRICAL ENGINEER

- The Electric Circuit. Units — ampere, ohm, volt. Difference between Electromotive Force and Potential difference. Ohm's Law, Kirchhoff's Laws. Simple series and parallel circuits involving e.m.f., currents and resistances. Non-linear resistors in parallel with constant value resistors. Power and energy, specific resistance. Temperature co-efficient of resistance. Conductor resistance, effect of length, area, material and temperature. d.c. 2-wire distribution system. Types of insulation. Wheatstone network bridge. Slide wire bridge, applications to steering gears, resistance pyrometers, strain gauges etc.,
2. Electrolytic action and secondary cells. Theory of Electrolytic dissociation applied to common solutions. Uses of electrolysis. Secondary cells (acid or alkaline) construction and principles, Maintenance Charging, Watt hour and ampere hour efficiencies.
 3. Electro-magnetism, electromagnetic induction, magnetic circuit. Mutual inductance magnetic theory. Magnetic field. Lines of force. Field strength. Field intensity. Magnetic fields due to current in straight conductors, loops, coils and solenoids. Relative direction of current and field. Faraday's and Lenz's Laws. Magnitude and direction of induced e.m.f. Force produced on a current carrying conductor. Flux density. Effect of iron, Magnetic motive force (m.m.f.). Permeability, Reluctance. Simple magnetic circuit, typical B/H and U/B curves.
 4. Electrostatics. Type of capacitor. Simple series and parallel circuits involving capacitors. Electric force and electric flux density, relative permittivity, charging and discharging currents of a capacitor connected in series with a resistor across a d.c. Supply. Energy stored in a capacitor. Generation of static-electricity.
 5. Electronics. Qualitative treatment of: Atomic structure and bonding. Semi-conductors. Junction diodes. The characteristics of junction transistors, the effect of voltage feed back on amplifier gain, input and output impedances. Equivalent circuits. Rectification. Simple treatment of thyristors and zener diodes. Simple transistor circuits. Conduction in gases, insulators, semi conductors and conductors. Photo electric effect.
 6. Alternating current theory, simple continuous periodic waves; Frequency, amplitude, instantaneous, maximum r.m.s. and average values; form factor. Phasor representation of a.c. quantities. Phase difference. The inductor. Inductance and its effect on the circuit. The capacitor. Capacitance and its effect on the circuit. Simple series and parallel circuits. Relationship between resistance, reactance and impedance. Simple treatment of power factor. Power in single phase a.c. circuit. Power factor improvement, Resonance, Star and Delta System.
 7. Instruments. Qualitative treatment of the principles and function of a.c. and d.c. indicating instruments and relays. Uses of shunts and series resistance to increase the range. Rectifiers and transducers.
 8. Distribution Systems. Systems for a.c. and d.c. Ship board installations. Protective devices such as fuses, circuit breakers, earth lamps. Cable material and installation. Connection of shore supply.

9. D.C. machines. The principles, construction details and production of d.c. series, shunt and compound wound motors and generators. 'Self-excitation', e.m.f. and load voltage equations. Load characteristics. Methods of voltage control, paralleling procedures and load sharing for generators. Need for and types of starter, speed and torque equations, speed control of d.c. motors.
10. A.C. machines. The principles, constructional details and protection of salient pole cylindrical and brushless alternators, squirrel-cage induction motors and single-phase transformers. Parallel running and synchronising theory. The EMF equation and automatic voltage regulation for an alternator. Auto transformers and current transformers.

SYLLABUS FOR TRAINEE ELECTRICAL ENGINEER

1. The Electric Circuit. Units — ampere, ohm, volt. Difference between Electromotive Force and Potential difference. Ohm's Law, Kirchoff's Laws. Simple series and parallel circuits involving e.m.f., currents and resistances. Non linear resistors in parallel with constant value resistors. Power and energy, specific resistance. Temperature coefficient of resistance. Conductor resistance, effect of length, area, material and temperature. d.c. 2-wire distribution system. Types of insulation. Wheatstone network bridge. Slide wire bridge, application's to steering gears, resistance pyrometers, strain gauges etc.
2. Electrolytic action and secondary cells. Theory of Electrolytic dissociation applied to common solutions. Uses of electrolysis. Secondary cells (acid or alkaline) construction and principles, Maintenance Charging. Watt hour and ampere hour efficiencies.
3. Electro-magnetism, electromagnetic induction, simple magnetic circuit. Simple magnetic theory. Magnetic field. Lines of force. Field strength. Field intensity. Magnetic fields due to current in straight conductors, loops, coils and solenoids. Relative direction of current and field. Faraday's and Lenz's Laws. Magnitude and direction of induced e.m.f. Force produced on a current carrying conductor. Flux density. Effect of iron, Magnetic motive force (m.m.f.). Permeability. Reluctance. Simple magnetic circuit, typical B/H and U/B curves.
4. Electronics. Qualitative treatment of : Atomic structure and bonding. Semi-conductors. Junction diodes. Junction transistors and their operating characteristics. Simple transistor circuits. Conduction in gases, insulators, semi-conductors and conductors. Photo electric effect.
5. Alternating current theory, simple continuous periodic waves; Frequency, amplitude, instantaneous, maximum r.m.s. and average values, form factor. Phasor representation of a.c. quantities. Phase difference. The inductor. Inductance and its effect on the circuit. The capacitor. Capacitance and its effect on the circuit. Simple series and parallel circuits. Relationship between resistance, reactance and impedance. Simple treat of power factor. Power in single phase a.c. circuit.
6. Instruments. Qualitative treatment of the principles and function of a.c. and d.c. indicating instruments and relays. Uses of shunts and series resistance to increase the range. Rectifiers and transducers.

SYLLABUS FOR ELECTRICIANS

The candidate is expected to have good knowledge of the items below. He will have to appear for an oral examination: Passing marks 50 %.

- (1) Electrical Circuits :-- Series and parallel circuits. Single 2-wire and 3-wire circuits. Simple calculation of current, voltage and resistance. Testing of circuits. Navigation light circuit.
 - (2) Electrical Instruments :-- Ammeter, Voltmeter, Megger, Circuit breaker, Principles and construction details.
 - (3) Units :-- Fair knowledge of Electrical Units.
 - (4) Basic knowledge of :-- Residual Magnetism, Lines of force, Induction, e.m.f., Ohm's law.
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- (5) Machine : Principles and working of A.C. & D.C. Generators and Motors.
 - (6) Main Switch Board :-- Knowledge of operation and maintenance of instruments and Safety devices fitted on main pannel, putting alternators/generators in parallel. Tracing earth faults.