

**DETAILED SYLLABUS FOR THE POST OF  
TECHNICIAN GRADE II (OPERATOR GRADE II)  
IN KERALA STATE BAMBOO CORPORATION LIMITED  
(Cat.No.: 253/2021)**

**(Total Marks- 100)**

**PART I : NTC MECHANICAL ( 25 Marks)**

**MODULE – I (8 Marks)**

Introduction to Engine: Description of internal & external combustion Engines, Classification of IC engines, Principle & working of 2&4-stroke diesel engine, compression ignition Engine (C.I), Principle of Spark Ignition Engine(SI), Differentiate between 2-Stroke and 4 stroke, C.I Engine and S.I Engine

Petrol Engine Basics: 4-stroke spark-ignition Engines- Basic 4-stroke Principles. Spark- ignition Engine components- Basic Engine components, Engine Cams & camshaft, Engine Power transfer, Scavenging, Counter weights, Piston Components.

Intake & exhaust systems –Electronic fuel injection Systems, Exhaust systems.

Intake system components, Air cleaners, Carburettor air Cleaners, EFI air cleaners, Intake manifolds, Intake air Heating.

Gasoline Fuel Systems:Description of Gasoline fuel, Gasoline fuel characteristics, Controlling fuel burn, Stoichiometric ratio, Air, density, Fuel supply system

**MODULE – II (9 Marks)**

Power Transmission – Belt drive, chain drive, gear drive

Belt drive – types of belt, size, specification, material, selection of type of belt, advantages and disadvantages of belt drive, calculation of length of belt and slip.

Chain drive – Types of chain, types of sprocket, specification of chain and sprocket, advantages and disadvantages of chain drive.

Gear drive – Type of gear, parts of gear, type of gear drives, specifications, advantages and disadvantages of gear drive, calculation of gear drive.

Other elements in power transmission – pulleys, shaft, bearing, clutches, keys, pins – type, specification, uses.

Lubrications – methods of lubrication, lubricants used, method of application, uses.

**MODULE – III (8 Marks)**

Limit, Fit, Tolerance – interchangeability, necessity in engineering field, definition BIS, definition and type of limit, terminology of limits and fits, basic size, actual size, deviation, high and low limits of size, zero line, tolerance zone.

Different standard systems of fits and limits, British standard systems, BIS systems.

Methods of expressing tolerance as per BIS.

Fit – definition, type – clearance, transition, interference – description of each.

Limit systems – hole basis and shaft basis systems.

Fundamental deviations and fundamental tolerance.

Thread – Types of thread, features of thread, applications of thread, thread cutting operations.

## **PART II : NTC ELECTRICAL (25 Marks)**

### **MODULE – I (8 Marks)**

Fundamentals of electricity, definitions, units & effects of electric current.  
Conductors and insulators.  
Conducting materials and their comparison.

### **MODULE – II (9 Marks)**

Ohm's Law; Simple electrical circuits and problems-Kirchoff's Laws and applications.  
Series and parallel circuits - Open and short circuits in series and parallel networks  
Laws of Resistance and various types of resistors.- Wheatstone bridge; principle and its applications.  
Effect of variation of temperature on resistance. Different methods of measuring the values of resistance. Series and parallel combinations of resistors.

### **MODULE – III (8 Marks)**

Conventional and nonconventional sources of energy and their comparison.  
Power generation by thermal and hydel power plants  
Various ways of electrical power generation by non-conventional methods.  
Power generation by solar and wind energy.  
Principle and operation of solar panel.

#### **Safety Practices**

- Fires in Electrical Circuits & Precautions
- Fire Extinguishers, its types and operations
- General Safety of Tools & Equipment
- Rescue of person who is in contact with live wire
- Treat a person for electric Shock/Injury

#### **Basic Tools and Accessories**

- Identification, usage of hand tools
- Maintenance of Hand Tools & usage of various Measuring Instruments
- Knowledge of Series and Parallel Circuit.

#### **Earthing**

- Carry out Pipe Earthing & Plate Earthing
- Carry out Testing and Maintenance of Earth Resistance
- Industrial Wiring & its concepts

#### **Control Panel Wiring concept**

### **PART III : NTC FITTER (25 Marks)**

#### **MODULE – I (6 Marks)**

Safety - Importance of safety, general safety, personal safety, machine safety precautions.

Personal protective equipments and its applications.

First Aid - Importance of first aid, basic first aid, ABC of first aid, aim of first aid, methods of giving first aid to the victim.

Fire – Fire triangle, class of fire, fire extinguisher, type of fire extinguisher, fire extinguisher recommended for each class of fire.

Handling of waste material – Waste material, list of waste material, methods of waste disposal.

Shop floor maintenance – Benefits of shop floor maintenance, introduction to 5 S concept, its applications and benefits.

#### **MODULE – II (7 Marks)**

Units – Units of linear and angular measurements, SI, CGS, MKS, FPS units, fundamental units and supplementary units, Unit conversions.

Linear measuring tools – outside calliper, inside calliper, steel rule, depth gauge, vernier calliper, vernier height gauge, micrometers – constructional features, working principle, least count, applications, care and maintenance

Angular measuring tools – bevel gauge, universal bevel gauge, bevel protractor, combination set, vernier bevel protractor – constructional features, working principle, least count, applications, care and maintenance.

Sine bar, slip gauge and dial test indicator – constructional features, working principle, applications, care and maintenance.

#### **MODULE – III (6 Marks)**

Hand tools – File, hack saw & blade, chisel, punch, hammer, jenny calliper, divider, tap & tap wrench, die & die stock, drill bit, reamer, scriber – type, use, constructional features, specifications, care and maintenance.

Gauges – Feeler gauge, SWG, screw pitch gauge, snap gauges, limit gauges, radius gauge, telescopic gauge, small hole gauge – use, constructional features, care and maintenance.

Marking media – White wash, Prussian blue, copper sulphate, cellulose lacquer – type, applications, preparation, advantages & disadvantages.

Holding and Supporting devices – Bench vice, machine vice, pipe vice, hand vice, pin vice, tool makers vice, V-block, parallel block, surface plate, angle plate, marking off table – type, use, constructional features, specifications, care and maintenance.

## **MODULE – IV**

**(6 Marks)**

Engineering materials – metals & non metals

Metals – ferrous metals – pig iron, wrought iron, cast iron, plain carbon steel – ore, manufacturing process, properties, uses, melting points.

Non ferrous metals – copper, aluminium, tin, lead, zinc – ore, manufacturing process, properties, uses, melting points.

Furnaces – cupola furnace, blast furnace – other making process of metals.

Heat treatment process – hardening, tempering, annealing, normalizing, case hardening – process, applications, important temperatures points.

Importance of safety and general precautions observed in welding shop

Welding – principle of welding, types of welding – forge welding, arc welding,

Gas welding, method of operation, tools and equipments used for welding – arc

Welding equipments, gas welding plant, gases used in gas welding, types of

Flames, types of joints in welding.

Soldering – Soldering iron – type, specification, uses, Solder – soft solder, hard solder, composition of various type of solder and their applications, Heating media of soldering

iron, flux type, selection and applications

Rivets – Type, size and selection for various works, method of riveting

Forging Process, Drilling Machines, Power Tool Operation, Different Complex Assembling and Fitting, Fastening, Lapping, Making Gauges, Pipe Works and pipe Joints, Dismantling, Overhauling & Assembling Valves.

## **PART IV**

### **II<sup>nd</sup> class Boiler Attendant Certificate (25 Marks)**

MODULE I: PROPERTIES OF FLUIDS AND MEASUREMENTS [4 marks]

Physical properties of fluids, density, specific weight, vapour pressure, buoyancy, Water hammer, Cavitation, Measurement of Pressure, measurement of temperature, absolute pressure, atmospheric pressure, gauge pressure, siphon, pyrometer, thermocouple, calculation of heat transfer area, Volume, Quantity of heat, evaporation capacity of boilers

MODULE II: PROPERTIES OF STEAM AND STEAM BOILERS [8 marks]

Formation of steam, Effect of pressure on boiling point of water, Conditions and properties of steam, saturated steam, Dry saturated steam, wet steam, superheated steam, Supersaturated steam, Functions of a Boiler,

Classification of boilers, Terminology of boilers, boiler rating, fire tube and water tube boilers, Horizontal and vertical boilers, single pass and multi pass boilers, Integral furnace boilers, external furnace boilers, wasteheat recovery boilers, small industrial boilers, packaged boilers, low pressure, medium pressure and high pressure boilers, Boiler performance, operation and maintenance of boilers, Boiler house instruments, Boiler house records, heat losses in boilers, danger of water lodging in steam pipes and the precautions to be observed in draining, procedure to be followed in the event of shortage of water, bulging or fracture of furnaces or flat plates or bursting of tubes or of any accident to a boiler or steam pipe.

MODULE III: BOILER MOUNTINGS AND ACCESSORIES [5 marks]

Steam boiler mountings and accessories, Safety valve, Water level indicators, reading of a pressure gauge, attachment for inspector's test gauge, Steam stop valve, Feed check valve, Blow off cock, manhole, mud hole, fusible plug, economisers, Air pre-heaters, Super heaters, Feed pumps, Injectors, automatic water level controller, use of non-return valves

MODULE IV: FUELS AND COMBUSTION [4 marks]

Classification of fuels used in boilers, solid fuels, Liquid fuels, gaseous fuels, Hydrocarbons, Calorific value of solid, liquid and gaseous fuels, Combustion of fuel, modes of heat transfer, conduction, convection radiation, draught, Classification of draught, natural and artificial draught, advantages of mechanical draught, forced and balanced draught, Functions of a chimney, best means of firing for the prevention of smoke.

MODULE V: BOILER WATER TREATMENTS [4 marks]

Scaling, corrosion and erosion in boilers, Boiler feed water parameters, Impurities in feed water, temporary and permanent hardness, Feed water treatment systems, Mechanical Treatment, Chemical Treatment, Heat Treatments.

**NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.**