DETAILED SYLLABUS FOR THE POST OF

Machine Operator Grade II in Kerala State co-operative coir Marketing Federation Limited

(Cat.No:657/2021)

Part I - NTC MECHANICAL (Total– 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 FITTER (Total – 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 firstaid, 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, introductionto 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, plane carbon steel ore, manufacturing process, properties, uses, melting points.
Non ferrous metals – copper, aluminium, tin, led, 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 III -NTC ELECTRICAL (Total – 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 IV - MACHINIST

Module -1.General safety precautions and importance of housekeeping (1 Marks)

Types of safety precautions -safety signs – first aid – PPE's – Response to emergencies – fire – fire extinguishers types and uses – Housekeeping-good shop floor practices – 5 S concept –waste material disposal and color codes for bins –methods of moving heavy equipments-basic understanding on hot work

Module -2 Marking and Marking tools, Measuring instruments (2 Marks)

Linear measurements - Steel rule – Marking media – Calipers – Dividers – Marking punches – Scriber – Hammer – Marking off table – Surface plate – vices – Angle plate – Try square – Combination set – Marking block – Parallel block

Module-3 Precision measuring instruments (2 Marks)

Micrometer (different types, parts, graduation, reading) – Vernier caliper – Dial Test Indicator- Bore dial gauge – Vernier height gauge –Vernier bevel protractor – Gear tooth caliper.

Module -4 Hand tools (02 Marks)

Hacksaw frame and blade – Saw setting – Files (types, uses, cut, grade, specification) – convexity of file – Pinning of file – Taps and Dies – Die nut – Chisel – Reamer

Module -5 Drilling , Lubricants and Cutting fluids, Maintenance (02 Marks)

Drilling machines – types – various operations in drilling machine – Drill – Drill holding devices – work holding devices – tap drill size – Cutting speed, feed and depth of cut in drilling – Drilling defects and causes.

Types of cutting fluids and purpose – Lubricants classification and properties – Lubricating system – Maintenance – Machine tool inspection

Module -6 Lathe (4 Marks)

Parts and functions – Types –Specification – Operations – Lathe accessories and attachments – Cutting speed, feed, RPM – Lathe tools and angles – Driving mechanism – Chip breaker – Taper turning methods – Taper and its types – Taper calculation – Sine bar and slip gauges – Screw thread and elements – Forms of screw threads – Lathe centre’s – Mandrel – Thread cutting – Single and multi start threads – Simple gear train and compound gear train – Lathe dogs – Driving plate – Face plate – Rests.

Module -7 Milling (3 Marks)

Milling machine – classification – specification – parts, functions – Application – cutter holding devices – milling cutters – cutter material – types of cutters – Nomenclature of milling cutter – Different milling operations – Up milling and down milling – Straddle milling – Gang milling – Cutting speed, feed and machining time – Dividing head types and uses – Types of indexing and calculations – Types of gears and uses – Elements of spur gear – Spur gear calculation – Selection of gear cutter – Helix and spiral elements, applications – Difference between helix and spiral – Methods of checking gear

and its parts – Rack elements, application – Cam types and applications – Jigs and fixtures – Gauges material and purpose – Different types of gauges.

Module -8 Grinding (1 Marks)

Types of grinding machines – parts and functions of each types – Different grinding operations – Construction of grinding wheel – Standard marking system of grinding wheels – Glazing and loading – Dressing and truing – Cutting speed, feed and depth of cut – Shapes of grinding wheel and applications – Selection of grinding wheel – Wheel balancing – Wet grinding and dry grinding – Tool and cutter grinder attachments and their uses.

Module -9 CNC Turning (6 Marks)

Safety in CNC turning centre's – Basic of CNC technology – CNC lathe machine elements and functions – Advantages and disadvantages – Controls , switches – NC co-ordinate system – Bed, chuck, tail stock, turret and spindle drive – slide ways, ball screw – ATC – Feedback encoder – open loop and closed loop control system – Axis's – Absolute and incremental modes – ISO G codes – ISO M codes – Edit and MDI mode functions – Cutting tool materials in CNC turning – Tool holders – Collisions – Process planning – Machining sequence – Cutting parameters – Work and tool offset – Machine operational modes – JOG, MPG, Edit memory – Entering and editing program – Use of emergency stop – Tool offset adjustments – Find alarm codes and meaning of those codes – Work holding device.

Module -10 CNC Milling (2 Marks)

General safety on CNC Vertical machining centre's – CNC-VMC elements and their functions – Machining operations and tool paths – Geometric and axis co-ordinates – Program sequence as codes – G codes and M codes – Part programming – Structure of a part program – Cutting tool materials and their composition – Cutting tool geometry – Tool wear – Tool life – Work holding in VMC – Machine operational modes – Tool offset adjustments in 1st part – Effects of sudden machine stoppage due to power shut down – Program transfer – Productivity concepts .