

**FURTHER DETAILS REGARDING MAIN TOPICS OF
PROGRAMME No. 05/2018 (Item No.11)**

**TECHNICAL ASSISTANT
LEGAL METROLOGY
(Category No.436/2016)**

PART I

**General Knowledge, Current Affairs and Renaissance in
Kerala**

Salient Features of Indian Constitution

Salient features of the Constitution - Preamble- Its significance and its place in the interpretation of the Constitution.

Fundamental Rights - Directive Principles of State Policy - Relation between Fundamental Rights and Directive Principles - Fundamental Duties.

Executive - Legislature - Judiciary - Both at Union and State Level. - Other Constitutional Authorities.

Centre-State Relations - Legislative - Administrative and Financial.

Services under the Union and the States.

Emergency Provisions.

Amendment Provisions of the Constitution.

Social Welfare Legislations and Programmes

Social Service Legislations like Right to Information Act, Prevention of atrocities against

Women & Children, Food Security Act, Environmental Acts etc. and Social Welfare

Programmes like Employment Guarantee Programme, Organ and Blood Donation etc.

RENAISSANCE IN KERALA

Towards A New Society

Introduction to English education - various missionary organisations and their functioning- founding of educational institutions, factories, printing press etc.

Efforts To Reform The Society

(A) Socio-Religious reform Movements

SNDP Yogam, Nair Service Society, Yogakshema Sabha, Sadhu Jana Paripalana Sangham, Vaala Samudaya Parishkarani Sabha, Samathwa Samajam, Islam Dharma Paripalana Sangham, Prathyaksha Raksha Daiva Sabha, Sahodara Prasthanam etc.

(B) Struggles and Social Revolts

Upper cloth revolts, Channar agitation, Vaikom Sathyagraha, Guruvayoor Sathyagraha, Paliyam Sathyagraha, Kuttamkulam Sathyagraha, Temple Entry Proclamation, Temple Entry Act, Malayalee Memorial, Ezhava Memorial etc.

Malabar riots, Civil Disobedience Movement, Abstention movement etc.

Role Of Press In Renaissance

Malayalee, Swadeshbhimani, Vivekodayam, Mithavadi, Swaraj, Malayala Manorama, Bhashaposhini, Mathnubhoomi, Kerala Kaumudi, Samadarsi, Kesari, Al-Ameen, Prabhatham, Yukthivadi, etc

Awakening Through Literature

Novel, Drama, Poetry, *Purogamana Sahithya Prasthanam, Nataka Prashtanam*, Library movement etc

Women And Social Change

Parvathi Nenmenimangalam, Arya Pallam, A V Kuttimalu Amma, Lalitha Prabhu, Akkamma Cheriyan, Anna Chandi, Lalithambika Antharjanam and others

Leaders Of Renaissance

Thycaud Ayya Vaikundar, Sree Narayana Guru, Ayyan Kali, Chattampi Swamikal, Brahmananda Sivayogi, Vagbhadananda, Poikayil Yohannan (Kumara Guru) Dr Palpu, Palakkunnath Abraham Malpan, Mampuram Thangal, Sahodaran Ayyappan, Pandit K P Karuppan, Pampadi John Joseph, Mannathu Padmanabhan, V T Bhattathirippad, Vakkom Abdul Khadar Maulavi, Makthi Thangal, Blessed Elias Kuriakose Chavara, Barrister G P Pillai, TK Madhavan, Moorkoth Kumaran, C. Krishnan, K P Kesava Menon, Dr. Ayyathan Gopalan, C V Kunjuraman, Kuroor Neelakantan Namboothiripad, Velukkutty Arayan, K P Vellon, P K Chathan Master, K Kelappan, P. Krishna Pillai, A K Gopalan, T R Krishnaswami Iyer, C Kesavan. Swami Ananda Theerthan, M C Joseph, Kuttippuzha Krishnapillai and others

Literary Figures

Kodungallur Kunhikkuttan Thampuran, KeralaVarma Valiyakoyi Thampuran, Kandathil Varghese Mappila. Kumaran Asan, Vallathol Narayana Menon, Ulloor S Parameswara Iyer, G Sankara Kurup, Changampuzha Krishna Pillai, Chandu Menon, Vaikom Muhammad Basheer. Kesav Dev, Thakazhi Sivasankara Pillai, Ponkunnam Varky, S K Pottakkad and others

GENERAL KNOWLEDGE AND CURRENT AFFAIRS

General Knowledge and Current Affairs

PART II

MECHANICAL ENGINEERING

MODULE - I

PROPERTIES OF MATERIALS - Mechanical properties, physical properties, thermal properties, electrical properties and chemical properties. TESTING OF MATERIALS - destructive and nondestructive testing. MEASURING INSTRUMENTS - precision and non-precision instruments. Vernier caliper, micrometer, Vernier height gauge and depth gauge. CLASSIFICATION OF GAUGES- plug gauge, ring gauge, snap gauge, screw pitch gauge, feeler gauge and standard wire gauge.

COMPARATORS - mechanical, electrical and optical comparators. (Working only). WELDING - classification of welding, advantages and limitations of welding, principle of arc welding, arc

welding machines such as DC generator and AC transformers. (working only). GAS WELDING - oxyacetylene welding (description only), gases used types of flames (uses) other welding such as submerged arc welding, MIG and TIG welding (description only). DEFECTS OF WELDING - causes and

remedies of the defects. Soldering and brazing (brief description). FOUNDRY - uses of different foundry tools, types of moulding sand, properties of moulding sand, different moulding processes such as bench moulding, pit moulding, floor moulding and sweep moulding. ALLOWANCES ON PATTERN - shrinkage, draft, machining, distortion, and rapping allowances. FORGING OPERATIONS- upsetting, drawing down, setting down, punching, welding and cutting (description only). FITTING- tools used in fitting (files, punches, vice, chisels, hammers, surface plate, surface gauge, V- Block, combination set, drills, calipers, taps and dies, reamers (uses of these tools). METALS AND ALLOYS- Types of cast iron, properties, application of cast iron. List the various types of steels such as low carbon steels, medium carbon steel, stainless steel, and high carbon steel and magnetic steel. Brief explanation of non-ferrous metals and alloys of aluminum and copper. Heat treatment - annealing, normalizing, hardening, tempering, case hardening (description only). METAL CUTTING - difference between orthogonal and oblique cutting, cutting speed, feed depth of cut (definition only), and properties of various cutting tool materials. LATHE - Types

of lathes, lathe parts, specifications, operations on lathe such as turning, taper turning, facing, boring, drilling, threading and reaming. Tool and work holding devices used in lathe.

MODULE - II

PROPERTIES OF FLUIDS - Density, specific weight, specific volume, specific gravity (simple problems). FLUID PRESSURE AND ITS MEASUREMENTS - define pressure, atmospheric pressure, absolute pressure and gauge pressure, pascal's law. Pressure measurement by piezo meter tube, simple manometer and differential manometer, (simple problems). Statement of Bernoulli's Theorem, Bernoulli's equation, continuity equation, working of venturimeter, orifice meter and Pitot tube (simple problems). ORIFICES - Types of orifices - vena contracta - coefficient of contraction, coefficient of velocity, coefficient of discharge (simple problems). NOTCHES - Rectangular Notch, Triangular Notch, discharge over notches (simple problems). LOSSES OF HEAD IN PIPES - major and minor losses - loss of energy due to friction - Darcy's formula for loss of head in pipes, Chezy's formula (simple problems). Turbines - classification, Impulse and reaction turbines, classification of reaction turbines, use of draft tube, working of Pelton wheel and Francis turbine. PUMPS - Different types of pumps (working only), function of air vessels, foot valve and strainer, slip of a pump. STRESS AND STRAIN - definition of stress, strain, longitudinal strain, lateral strain, Poisson's ratio, factor of safety, statement of hook's law, (simple problems). FRICTION -

Types of friction, laws of friction, definition of angle of friction, coefficient of friction and limiting of friction (simple problems).

MODULE - III

BOILER - define boiler, function of boiler - classification of boiler, comparison, boiler specifications, Boiler mountings and boiler accessories (working and functions only). PROPERTIES OF STEAM - wet steam, dry steam, super heating steam, and dryness fraction (definition only). Working of steam engine, function of steam nozzles, working of steam turbines, classification steam turbines. STEAM CONDENSERS - jet condensers and surface condensers (working only). POWER PLANTS - types of power plants such as hydroelectric, thermal, nuclear and diesel power plants. RENEWABLE SOURCE OF ENERGY - solar energy. MANAGEMENT - meaning of management, Taylor's scientific management, contribution of FW Taylor, Henry Fayol's principle of management. DIFFERENT TYPES OF OWNERSHIP - sole proprietorship, partnership, private limited company, public limited company (brief description). ORGANIZATIONAL STRUCTURE - line organization, functional organization, line and staff organization. OBJECTIVES OF TRAINING - explain the methods of training. WAGES - importance of good wage plan, types of wages, wage payment systems - INCENTIVES - straight piece rate system, time rate system, piece rate system with guaranteed minimum wage - differential piece rate system (explanation only). Differentiate IC and EC engine, working four stroke petrol and diesel engine, two stroke petrol and diesel engine, comparison of petrol and diesel engine, comparison of four stroke and two stroke engine. Functions of carburetor and fuel injector. CLASSIFICATION OF COOLING SYSTEMS - air cooling and water cooling, functions and radiator and thermostat.

GOVERNING OF IC ENGINES - quantity governing, quality governing, hit and miss governing. TRANSMISSION SYSTEMS - function of clutch, flywheel, gear box, propeller shaft and differential. FUNDAMENTALS OF THERMODYNAMICS - concept of system - open, closed, isolated system. Intrinsic properties and extrinsic properties - Laws of thermodynamics and laws of perfect gases - Thermodynamic processes - constant volume process, constant pressure process, adiabatic process, and isothermal process (explanation only). REFRIGERATION - purpose of refrigeration, unit of refrigeration, concept of cop. Working of air compression refrigeration system based on reversed Carnot cycle and Bell Coleman cycle. Cop of Carnot cycle (simple problems). Working of vapor compression refrigeration system.

INSTRUMENTATION

MODULE I -GENERALIZED INSTRUMENTATION SYSTEM - Primary sensing, Variable conversion, Data transmission, Variable manipulation, Data presentation elements with examples - Classify instruments such as Absolute and secondary instruments, Deflection and Null deflection Instruments - Analog and Digital Instruments - Indicating, Recording and Controlling Functions of Instruments - Units of various electrical and non electrical quantities - standards of measurements - International standards, Primary standards, Secondary standards, Working Standards Static Characteristics : Accuracy, Precision, Sensitivity, Linearity, Resolution, Hysteresis, Reproducibility, Drift etc with problems to calculate these parameters - Limiting Error - Relative Limiting Error - Gross Error, systematic Error, Random Error.

MODULE II-TRANSDUCER - Classification - active, passive, analog and digital - sensors and transducers - mechanical and electrical transducer with examples - principle of resistive transducers - principle of operation of linear and rotary potentiometer - sensitivity of linear and rotary potentiometer - loading effect - strain gauges - expression for gauge factor - types of strain gauges - advantages and disadvantages of semiconductor strain gauges - strain gauge bridge circuit.

MODULE III-VARIABLE INDUCTANCE TRANSDUCER - Classification of Inductive transducers - variable reluctance and variable eddy current inductive transducer - construction and working of LVDT - applications of LVDT - Different types of Magnetic transducers - Working of search coils - Operation of magneto resistive transducer - Magneto resistive and magneto strictive transducer - Hall effect transducer.

MODULE IV-VARIABLE CAPACITIVE TRANSDUCER - Working of variable area, variable distance, and variable dielectric type capacitive transducers - Differential capacitive transducer - Applications of variable capacitive transducer - Piezo electric effect - principle of operation of Piezo electric transducers - equivalent circuit pressure measurement and accelerometer applications - Photoelectric effect - working principle of photo emissive cell, Conductive cell, Photo voltaic cell, photo multiplier tube, solar cells - applications of photoelectric transducers.

MODULE V- PRESSURE MEASUREMENT - Definition of pressure - pressure head - different types of pressure - units of pressure and its conversions - Classification of manometers - working of U tube manometers, well type manometers, inclined manometers, bell type manometers, errors in manometers - constructional details and working of C-type, spiral and helical bourdon gauges - Bellows - Diaphragms and capsules - Calibration of pressure gauge using Dead Weight Tester - Strain gauges, capacitive type pressure gauge - Piezo electric pressure sensor - Fiber optic pressure sensor - Differential pressure transmitter for pressure measurement - construction and working of McLeod gauge, Pirani gauge - Ionization gauge.

MODULE VI-LEVEL MEASUREMENT - Sight glass technique - Float type level indicator method - Displacer and torque tube type level indicator. Air purge type level indicator - Capacitive and conductive level indicator - Ultrasonic level gauge - Strain gauges - capacitance type level indicator - Radiation absorption method and laser method used for level indication - fiber optic level sensor - Level switch - Differential Pressure type level transmitter - Calibration of level detectors.

MODULE VII-TEMPERATURE MEASUREMENT - Definition of temperature - different temperature scales and conversions - Working of bimetallic thermometer, Mercury in glass thermometer, Mercury in steel thermometer, Gas and vapor pressure thermometer - construction and working of radiation pyrometer, optical pyrometer. Definition of PTC & NTC - construction and working of resistance temperature detector - different types (Ni, Cu & Pt) - characteristics of RTD - Thermistor & Its types - properties - Thermistor characteristics - Applications of Thermistor - See beck effect - Peltier effect and Thomson effect - laws of thermocouple - law of intermediate temperature and law of intermediate metals - different types of industrial thermocouples - J, T, K, S, R - properties of different types - thermopile - Compare the characteristics of Thermocouple, RTD and Thermistor.

MODULE VIII-FLOW MEASUREMENT - Principles of Flow measurements - laminar and turbulent flow - Reynold's number - continuity equation -Bernoulli's equation for ideal fluid - variable area flow meters - Rota meter - variable Head flow meter - Different types of orifice plate and tapings. Orifice plate flow meter. Venturi meter - flow nozzle - Dahl tube - Pitot tube - Differential Pressure flow transmitter. Special type flow meters - electromagnetic flow meters - turbine flow meter - mass flow meters - ultrasonic flow meters - Vortex flow meter - Hot wire anemometer - Positive displacement flow meters - oval gear Nutating disc type - Reciprocating piston type - Open channel flow meters - Weirs - V notch - Rectangular notch.

MODULE IX-VISCOSITY AND HUMIDITY MEASUREMENT - Absolute viscosity - Kinematic viscosity - relative viscosity - units - Saybolt Viscometer - Redwood Viscometer - Specific gravity measurement -Definition - Static pressure operated mechanism - weighing tube type - Hydrometer - Humidity measurement - Definition - humidity - relative humidity - Absolute humidity - Dew point measurement methods - Wet and dry bulb method - Sling psychrometer - Hair hygrometer - resistive hygrometer - Dew cell - cold mirror method - Moisture measurement - Definition - capacitive hygrometer method.

MODULE X-FORCE MEASUREMENT - Load cells - hydraulic - pneumatic - strain gauge load cells - Speed measurement classifications - mechanical tachometer - Stroboscope - non contact method - Torque measurement technique using strain gauge - Acceleration measurement - Seismic accelerometer - LVDT accelerometer - Piezoelectric accelerometer.

MODULE XI-pH MEASUREMENT - Introduction - Sorensen's scale - Buffer solution - electrodes for pH measurements, measuring electrodes - Hydrogen electrode, glass electrode, errors and its compensation in glass electrode - calomel electrode - combined pH electrode - Industrial electrode assemblies - DIP and Flow type Digital pH meter - pH control in effluent treatment - Chromatography - classification - Gas chromatography - Liquid chromatography - Paper chromatography.

ELECTRONICS

BASIC ELECTRONICS

1. Study of resistors.

2. Study of capacitors, inductors, transformers.
3. Conductors, insulators, semiconductors, intrinsic semiconductor, extrinsic semiconductor, doping, majority and minority carriers, V-I characteristics of diodes.
4. Principle of rectification, different types of rectifiers.
5. Different types of transistors, different configuration.

DIGITAL ELECTRONICS

1. Different number systems, conversion from one to other.
2. Boolean algebra, reduction of Boolean expression.
3. Different logic families.
4. Adders and subtractors, Multiplexer and De Multiplexer, encoder and decoder.
5. Flip flops, shift register and counter.
6. Different types of memories.

LINEAR INTEGRATED CIRCUITS

1. Basics of OP-AMP.
2. Different applications (adder, subtractor, detector, rectifiers, integrator, differentiator etc.)

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.