GOVERNMENT OF SIKKIM
ROADS & BRIDGES DEPARTMENT
GANGTOK.

No. 434/R&B Dated : 16/12/ 2013

N O T I F I C A T I O N

Rules for open competitive Examination to be conducted by the Sikkim Public Service Commission in 2013 for selection of candidates for appointment to the post of Junior Engineer (Mechanical) under various Department is published for general information.

1. The number of vacancies to be filled up after the Examination will be specified in the Notice to be issued by the Sikkim Public Service Commission.
2. The Examination will be conducted by the Sikkim Public Service Commission according to syllabus and procedure as indicated in the **Appendix I** to these Rules.
3. The date and place of Examination will be fixed by the Sikkim Public Service Commission.
4. Candidate must write the answers in his/her own hand. Under no circumstance will he/she be allowed the help of a scribe to write the answers, except otherwise permissible under the rule in case of physically challenged candidates duly certified by the competent authority.
5. A candidate must pay fees prescribed by the Commission.
6. The decision of the Commission as to the eligibility of a candidate for admission to the examination shall be final. Their admission at al the stages of examination for which they are admitted by the commission viz: main (Written) Examination and Interview Test will be purely provisional, subject to their satisfying the prescribed eligibility conditions. If on verification at any time before or after the Main (Written) Examination and Interview Test, it is found that they do not fulfill any of the eligibility conditions, their candidature for the examination will be cancelled by the Commission.
7. No candidate will be admitted to the examination unless he/she holds a certificate of admission issued by the Commission. The admission to all the stages of the Examination will be purely PROVISIONAL subject to his/her satisfying the prescribed eligibility conditions. Mere issue of admission certificate to the candidate will not imply that his/her candidature has been finally cleared by the Commission.

8. The examination will consists of 02 (two) papers:-

Mechanical Engineering	-	a) Paper-I	-	300 marks (3 Hours)
		b) Paper-II	-	300 marks (3 Hours)

The question papers for both the papers will be of objective type (Multiple choice)

The number of candidate to be called for Viva-voce/Personality Test will be around two times the number of vacancies in different categories.

The Viva-Voce will be of 75 marks (12.5% of the total marks)

09. a) Mobile phones, pagers or any other communicable devices are not allowed inside the premises where the examination is being conducted. Infringement of the instructions shall entail appropriate action including ban from taking the examination.

b) Candidates is advised not to bring any valuables/costly items to the venue of the examination as safe keeping of the same cannot be assured. Commission will not be responsible for any loss.

10. If the candidates wishes to seek clarification regarding question papers he/she shall do so by representing in writing addressed to the Secretary, Sikkim Public Service Commission duly indicating (i) his/her Name and Roll Number (ii) Name of the subject and examination (iii) Question number and iv) Nature of doubt. Such complaint regarding errors in question paper should reach the Commission in writing within 2 (two) days of the completion of examination. The Commission may constitute an Expert Committee to examine the errors in the question paper. In case, the errors in the question paper are found by the expert Committee, such questions will be deleted from the total numbers of questions and the marks in respect of those wrong questions shall be distributed equitably among the remaining questions.

The Commission under exigencies, May at its discretion, cancels the entire examination or the examination of a particular subject of that examination.

11. The Commission shall have the discretion to fix the qualifying marks in any or all subjects in the written Examination. The candidate must obtain the qualifying marks decided by the SPSC in the written exam.

12. Candidate, who obtains such minimum qualifying marks in the written examination, as may be fixed by the Commission, shall be called for Interview. In the Interview there will be a minimum of 50 marks or as assigned by the Commission at their discretion.

13. The form and manner of announcement of result of the examination shall be decided by the Commission. The Commission will not enter into any correspondence with any individual candidate regarding collection of admit card, date of examination, date of viva voce and declaration of result.

14. After the examination and interview, the names of the successful candidates will be arranged by the Commission in order of merit based on marks awarded to each candidate. Candidates shall be considered for appointment to the available vacancies in the order in which their names appears in the merit list.

15. (a) A candidate who is or has been declared by the Commission to be guilty of:-

(i) Obtaining support for his candidature by the following means, namely:

(a) Offering illegal gratification to; or

(b) Applying pressure on; or

(c) Blackmailing, or threatening to blackmail any person connected with the conduct of the examination ; or

ii) Impersonation; or

iii) Procuring impersonation by any person; or

iv) Submitting fabricated documents or documents which have been tampered with; or

v) Making statements which are incorrect of false or suppressing material information; or

vi) Resorting to the following means in connection with his candidature for the examination, namely:-

a) Obtaining copy of question paper through improper means;

b) Finding out the particulars of the persons connected with secret work relating to the examination;

c) Influencing the examiner; or.

vii) Using unfair means during the examination; or

viii) Writing obscene matter or drawing obscene sketches in the scripts; or

ix) Misbehaving in the examination hall including tearing of the scripts, provoking fellow examinees to boycott examination, creating a disorderly scene and the like; or.

x) Harassing or doing bodily harm to the staff employed by the Commission for the conduct of their examination; or

xi) Being in possession of or using any mobile phone, pager of any electronic devise or any other equipment capable of being used as a communication device during the examination; or

xii) Violating any of the instructions issued to candidates along with their admission certificate permitting them to take the examination; or

xiii) Attempting to commit or, as the case may be, abetting the commission of all or any of the acts specified in the foregoing clauses, may in addition to rendering himself liable to criminal prosecution, be liable:-

a) To be disqualified by the Commission from the Examination for which he is a candidate; and/or

b) To be debarred either permanently or for a specified period:-

i) By the Commission, from any examination or selection held by them;

ii) By the State Government from any employment under them; and

c) If he is already in service under Government, disciplinary action under the appropriate rules:

Provided that no penalty under this rule shall be imposed except after:-

i) giving the candidate an opportunity of making such representation in writing as he may wish to make on that behalf; and

ii) Taking the representation, if any, submitted by the candidate within the period allowed him into consideration.

16. A candidate who is or has been declared by the Commission guilty of any attempt on his/her part to obtain support for his/her candidature by any unfair means shall render him/her liable to be disqualified for admission to the competitive examination at any stage.

17. Candidate already in Government service or in government owned undertaking or similar organization, whether in permanent or temporary capacity or as work charged employee, shall be required to submit his/her application along with No Objection Certificate from his/her employer.

18. Success in the examination confers no right to appointment unless Government is satisfied after such enquiry as may be considered necessary, that a candidate, having regard to his/her character and antecedents, is suitable in all respects for appointment.

19. A candidate must be in good health and free from any physical defect likely to interfere with the discharge of his/her duties as an officer of the Service. A candidate who (after such medical examination as may be prescribed by the competent authority) is found not to satisfy these requirements will not be appointed.

20. If a candidate's handwriting is not legible, deduction in marks may be made on this account from the total marks otherwise accruing to him/her.

21. No traveling and daily allowance will be paid for the journey performed in connection with the examination, interview and medical examination. All other matters not specified or for which no provision has been made in these rules shall be regulated by rules and orders applicable to the service to which recruitments are being made.

22. The candidates may see the SPSC website (www.spsckm.gov.in) for detail instruction for filling up of OMR Sheet (Optional Mark Reader) for objection type questions.

23. The candidate on selection and during the period of probation of apprenticeship/training, pay shall be governed by the Notification No.489/GEN/DOP dated the 31st October, 2011.

BY ORDER AND IN THE NAME OF GOVERNOR

Sd/-(T.B.Rajalim)

Principal Chief Engineer cum Secretary

ROADS & BRIDGES DEPARTMENT

Copy for information to:-

1. Secretary, SPSC – (10 copies)
2. File & Guard file

SCHEME AND SYLLABUS OF EXAMINATION FOR THE PURPOSE OF FILLING UP THE POST OF JUNIOR ENGINEER (MECHANICAL) UNDER VARIOUS DEPARTMENT

The Examination will consist of 2 papers:-

SUBJECT	PAPERS	FULL MARKS	TIME ALLOWED
MECHANICAL ENGINEERING	PAPER - I	300 (THREE HUNDRED)	3 HOURS
	PAPER – II	300 (THREE HUNDRED)	3 HOURS

VIVA-VOCE/PERSONALITY TEST - - 75 Marks

SYLLABUS:

PAPER-I: - - 300 Marks

1. **MATHEMATICS**

Surds, Logarithms and Quadratic Equations: Surds, Logarithms, Quadratic Equations. Sequences and Series: Sequences, Arithmetic Progression, Geometric Progression.
Binomial Theorem and Computer Mathematics: Binomial Theorem, Computer Mathematics. Trigonometric Functions: Angles, Circular Functions of Trigonometric Ratios, Inverse Trigonometric Functions.
Applications of Trigonometry: Properties of Triangles, Solutions of Triangles, Heights and Distance.
Coordinate Geometry and Straight Line: Cartesian coordinate system.
Circles and Conic Sections: Circle, Conic Section.
Vector Algebra: Basic Concepts, Components of a Vector, Operations on Vectors, Product of Two Vectors.

Differential Calculus: Real Number System, Functions, Limits, Continuity, Derivative.
Applications of Derivatives: Application to Geometric, Derivative as a Rate Measure, Increasing and Decreasing Functions, Maxima an Minima, Roller Theorems, Mean Value Theorem, Curve Sketching.
Indefinite Integrals: Antiderivatives, Basic Definitions, Methods of Integration, Integration of Rational Functions, Integration of Irrational Functions.
Definite Integrals:Definite Integrals, Fundamental Theorem of Calculus, Properties of Definite Integrals: Applications.
Complex Numbers: Complex Numbers,. Geometrical Representation of Complex Numbers, Exponential and Circular Functions of Complex Numbers.
Matrices and Determinants: Matrices, Matrix Multiplication, Determinants, Adjoint and Inverse of a Matrix, Solutions of Linear Equations with the help of Inverse of a Matrix
Statistics: Statistical Data and Variations and Units of Observations, Constructions of Frequency Tables (or Frequency Distributions) from Raw Data, Graphical Presentation of Frequency Distributions, Measures of Location and Dispersion.

2. PHYSICS

Properties of Matter: Surface Tension, Fluid Statics, Fluids in Motions, Elasticity.
Thermal Energy: What is Heat? Mechanical Equivalent of Heat, Modes of Heat Transfer, Kinetic Theory of Gases.
Sound: Waves, Sound and its Characteristics, Speed of Sound: Newtons's Formula.
Light: Laws of Reflection and Laws of Refraction, Image Formation by Reflecting Surfaces, Image Formation of Refracting Surfaces, Optical Instruments, Photometry.
Electricity and its Effects: Electric Charge and Electric Force, Simple Electrical Circuits, Electrical Instruments, Heating Effects of Current, Chemical Effects of Currents, Sources of EMF: Battery.
Magnetism: Magnetic Field, Electric Origin of Magnetism, Biot-Savert's Law, Effects of Magnetic Field on Electric Current, Motion of a Charged Particulars in magnetic Field, Magnetic Matarials.

3. CHEMISTRY

Periodic Table and Periodic Properties; Development of Periodic Table, Periodic Table and Electronic Con figuration of Elements, Periodic Properties.
Non-Metal; Atmosphere, Hydrogen, Nitrogen and Ammonia, Chlorine, Acids.
Metals; Occurance and Properties of Metals,Iron and Steel, Copper, Aluminium,Alloys.
Water Technology; Sources of Water,Structure of Water, Solvent Action of Water, Hardness of Water, Sludge and Scale Formation of Boilers, Boiler Corrosion and its prevention, pH Valve and Water Treatment.
Fuels: Classification of fuels, Calorific valve of fuels, Characteristics of a Good Fuel, Comparison between Solid, Liquid, and Gaseous Fuels, Determination of Calorific Value, Solid fuels, Liquid Fuels, Gaseous Fuels.
Lubricants; Lubricants, Lubrication, Selection of Lubricants, Classification of Lubricants, Lubricating Emulsion, Gases as Lubricants, Gases as Lubricants, Properties of Lubricants.
Polymers: Importance of Polymers, Type of Polymers, Properties of Polymers, Moudling of Plastic, Rubber
Glass and Ceramics: Manufacture of Glass, Glass Transition, Varieties of Glasses, Ceramics. Refractories, Bleaching Powder, Commercial Bleaching Powder.

4. APPLIED MECHANICS

Coplanar and Non-Coplanar Forces: System of Forces, Coplanar Force, Resultant of Concurrent Forces. Moment of a Force, Resultant of Non-concurrent Forces.
Equilibrium; Free body diagram, Types of supports and Constraints, Free body Diagrams, Equilibrium of Coplanar Forces, Plane Trusses.
Friction; Laws of Friction, Problem Involving Dry Friction, Inclined Plane, Wedge Friction and Screw Friction, Simple Machines
Centre of Gravity and Moment of Inertia: Concept of Centre of Gravity, Moment of Inertia of Area.
Rectilinear Motion, Projectiles and Relative Motion: Rectilinear Motion, Projectiles, Relative Motion.
Laws of Motion: Newton's Laws of Motion, Motion on a Circular Path, Simple Harmonic Motion, Work, Power and Energy.

5. ENGINEERING MATERIALS

Classification of Iron and Steel, Types of Cast Iron, Steel and Alloy Steels, Important Ores and Properties of Non-Ferrous Materials, Properties and Uses of Alloys, Plastics, Reinforced Plastics, Classification, Ceramics, Refractory and Abrasives.

6. ENGINEERING DRAWING

INTRODUTION TO DRAWING, GEOMETRICAL CONSTRUCTION, ORTHOGRAPHIC PROJECTIONS-I, ORTHOGRAPHIC PROJECTIONS-II, Sections of Solid, ISOMETRIC AND OBLIQUE PROJECTIONS, SURFACE DEVELOPMENT.

7. WORKSHOP TECHNOLOGY

Carpentry: Classification of Carpentry Tools, Types of Work & Working Procedure, Joints in Carpentry Work.
Pattern Making and Foundry: Pattern making Foundry
Fitting and Plumbing: Tools and Devices in Fitting – work, Operation in Fitting Work, Tools in Plumbing Work, Operations in Plumbing Work, Pipe Fitting and Joints.
Sheet Metal Work: Types of Tin-Smithy Joints, Soldering, Brazing, Fluxes, Metal Used in Tin Smithy Works, Hand Tools and Machines, Sheet Metal Operation, Layout of Patterns.

Welding: Gas Welding, Equipment for Oxy-Acetylene Gas Welding, Fluxes, Gas Flame, Arc Welding, Polarity in Arc Welding, and Electrodes for Arc Welding Equipment, Arc Welding Processes.

Smithy and Forging: Forging Materials, Tools and Equipments used in forging, Forging Operations, Power Hammers and Presses, Rivet, Heat treatment

Machine Tools: Function of Lathe, Types of Lathe Accessories and Attachments, Lathe Operations, Cutting Tools, Terms Used in Cutting Operation.

Painting: Paints, Varnishes.

8. BASIC THERMAL ENGINEERING

Basic Concepts and Gas Laws, Laws of thermodynamics, Formation of Steam and its Properties, Steam Generators, Steam Prime Movers, Steam Condensers, Steam Power Plants, Heat Transfer, Other sources of energy.

9. E/M ENGINEERING

Introduction to Electricity: Electricity, Current, Resistance of a Conductor,Kirchhoff's Laws, Batteries.

Electromagnetism, Electrostatics and Electrical Instruments:

Magnetism, Biot-Savart Law and its Applications, Electromagnetic Induction, Static Electricity, Electrical Instruments, Hysteresis

AC Circuits: Sinusoidal Signals, Impedance Concept, Concepts Relating to Power, Three-phase Circuits.

Electrical Machines: DC Machines, Transformers, Distribution of Electricity

Units of Measurement, Gas Laws and Fuels: Basic Units of Measurement, Thermodynamic Systems, Gas Laws, Laws of Thermodynamics, Energy Conversion Cycles, Fuels.

Internal Combustion Engines: Classification, Cycles, Four Stroke and Two Stroke Engines, Engine Performance, Octane and Cetane Numbers, Pollution.

Refrigeration and Air- conditioning: Refrigeration Cycle, Vapour Compression Refrigeration, Refrigeration Capacity, Refrigerants, Absorption Sysftem, Ammonia Hydrogen Refrigeration System, Steam Jet Refrigeration, Thermoelectric Cooling, Indirect Refrigeration, Air Conditioning, Psychrometry , Comfort Air Conditioning, Summer Air Conditioning (Humid Air), Winter Air Conditioning, Summer Air Conditioning (Dry Air), Package Air Conditioner, Evaporative Cooler, Ducting.

Lifts and Cranes: Basic Principles, Lifts (Elevators), Escalator, Lifting of Load, Some Basic Crane Mechanisms, Types of Crane, Rotary Cranes or Derricks.

10. COMPUTER BASICS

Introduction to Computers: Why Computer?, Evolution of Computers, Components of a Computer, Hardware Vs Software, System Vs Application Software, Bits and Bytes, Input and Output Devices, ROM/RAM, Secondary Storage Devices
Microsoft Windows: Microsoft Windows, Windows Desktop, Working with Windows, Exploring the Control Panel, Common Accessory Applications, Windows Explorer
Ms Word Part I: About Ms Word, Ms Word Screen Layout, Creating Documents, S Word Menus, Standard Toolbar, Formatting Toolbar
Ms Word II: Creating a Simple Document, Bullets, Numbering the Text, Aligning the Text, Spelling and Grammar Check, Print Preview, Print , Saving the document, Closing the document, Opening the document, Exiting MS Word, Selecting a Template,
Starting the Template and selecting the Template Style, Header and Header Items, Recipients name and the closing items, Header and Footer, Typing the Text, Creating and modifying tables, Creating rows and columns, Inserting rows and columns, Merging rows and columns,
Introduction to Spreadsheets Part-I: Starting Ms Excel, Excel Screen Layout, and Excel Menu Ms
Excel Toolbars: Standard Toolbar, Formatting Toolbar, Creating a Simple Worksheet, Functions Ms Power Point: About Power Point, Toolbars, Creating a simple presentation, Making yours presentation attractive, Viewing a presentation, Printing a presentation, Getting Help.
Internet and E-Mailing: Internet Basics, Starting the Internet, Searching, E-Mailing, Internet Chat.

11. STRENGTH OF MATERIALS

Stresses and Strains: Basic Concepts, Mechanical Behavior of Materials, Deformation of Bars, Composite Bars, Thermal Stresses and Strains, Relationship between Elastic Constants.
Principle Stresses: State of Stresses, Normal and Shear Stresses, Stress on Oblique Sections, Principle Stresses and Principal Planes.

Shear Forces and Bending Moments: Beams, Shear Forces and Bending Moment, Shear Force and Bending Moment Diagram.
Stresses in Beams: Simple Bending or Pure Bending, Moment of Resistance, Bending Stress Distribution, Practical Applications, Section Modulus, Shear Stress Distribution in Beams.
Deflection of Beams: Curvature of Bending Beam, Differential Equation of Deflection Curve, Double Integration Method for Slope and Deflection.
Torsion: Torsion of Circular Shafts, Power Transmission by Shafts.
Columns and Struts: Failure of a Column or Strut, Sigh Conventions, Types of End Condition of Columns, Equivalent Length of a Column, Slenderness Ratio, Factor of Safety, Indian Standard Specifications for Columns.

12. MACHINE DRAFWING

Different Views in Orthographic Projections
Sectional Views, Other Sections, Auxiliary View, Missing Lines and Missing Views.
Screw Threads, Nuts And Bolts
Screw Threads Terms, Standard Thread Forms, Right and Left Hand Threads, Single and Multiple Start Threads, Thread Profile Types, Square, Acme and Buttress Threads, Representation of Threads, Nut and Bolt, Shape of Bolt Head and Nut, Procedure of Drawing,Drawing Complete Bolt, Square Headed Bolt and Square Nut, Washer, Stud, Eye, Bolt, Other Bolt Heads, Other Nut Shapes.
Riveted Joints.
Riveting, Types of Riveted Joints, Nomenclature.
Key, Cotter and Knuckle Joints
Key, Types of Key, Gib Head Key, Cotter and Cotter Joint, Sleeve Cotter Joint, Socket and Spigot Cotter Joint, Joining of Roads, Knuckle Joint.
Assembly Drawing
Valve drawing spring loaded valves, coupling, universal coupling, flang coupling, bearings and plumber blocks ball and roller bearings.

13. THEORY OF MACHINES

Simple Mechanisms, Friction, Power Transmissions, Flywheel, Governor, Balancing, Vibrations.

14. REFRIGERATION AND AIR-CONDITIONING

Refrigeration and Air Conditioning, Refrigeration Cycle, Refrigeration Equipment, Refrigerants, Refrigeration Systems, Properties of Moist Air, Air Conditioning Equipment and their Applications.
Refrigeration Systems: Basic definitions, scope and relevance of ME081, applications, Components of Refrigeration System, Refrigerants, Methods of Refrigeration, Air Refrigeration Systems simple Vapour Compression System, Multi Pressure Systems, Vapour Absorption System Production of low temperatures, All Methods and need of defrosting.
Ice Manufacturing- principle, methods, systems used to form ice, quality of ice, ice factory, special ice machines. Case study on ice production and ice cream production.

PAPER- II: - 300 Marks

1. HEAT POWER TECHNOLOGY

Engine Fundamentals, Intake and Exhaust Systems, Ignition and Starting Systems, Friction and Lubrication, Cooling Systems, Mechanisms, Power Transmission, Governors, Flywheel, LIMITS FITS and Gauges.

2. MECHANIFCS OF MATERIALS

Basic Concept, Principal Stresses and Strains, Bending Stresses, Torsion in Circular Shafts Strain Energy and Impact.

3. POWER TRANSMITTING ELEMENTS

Power Transmission Concepts, Drives, Chain Drives, Bevel Gears, Worm Gears, Gear Manufacturing.

4. ENGINEERING THERMODYNAMICS

Basics of Thermodynamics, First Law of Thermodynamics, Second Law of Thermodynamics, Ideal Gas Properties and Processes, Properties of Steam and Vapour Processes, Fuels and Combustion, Availability (Energy).

5. FLUID MECHANICS

Basic Concepts, Flow of Fluids, Flow through Orifices, Flow through Mouthpieces and Minor Losses, Flow through Simple Pipes.

6. ENGINEERING METALLURGY

Introduction and scope of the subject, Introduction to Engineering Materials. Lattice Structures and effect on their property relationship, indexing to Lattice planes and directions.
Plastic deformation- Mechanisms. Deformation of single crystals and polycrystalline metals, Imperfections in crystals, dislocations, work hardening, cold and hot working of metals.
Engineering Steels and Alloys-
Detail study of equipments and methods for micro structural analysis
Microstructure and Microstructure property relationship of following steels-
Plain carbon steels, Effects of alloying elements, alloys steels such as stainless steels, tools steels,
Special purpose steels with applications.
Cast Iron – Microstructure and Microstructure property relationship –Classification of cast iron- Gray C.I., White C.I., Nodular C.I., Chilled C.I., Alloy C.I., Malleable C.I., and applications of all types.
Engineering Nonferrous Alloys- Microstructure and microstructure property relationship- Copper alloys, Aluminium alloys, Nickel alloys, Bearing materials and applications of all types.
Heat Treatment of steels- Transformation products of austenite. Time –temperature-transformation diagrams, critical cooling rate. CCT diagrams.
Heat treatment of steels – Annealing, Normalizing, Hardening and tempering. Hardenability of steels,

Surface hardening treatments – carburizing, Nitriding, Carbonzing, Induction hardening, and flame hardening.
Powder Metallurgy- Advantages and limitations. Characterization and testing of metal powders, powder manufacture, powder conditioning. Production of sintered structural components, self lubricating bearings, cemented carbides, cermets, sintered carbide cutting tools. Refractory metals. Electrical contact materials, frication materials. Diamond impregnated tools.

Non Destructive Testing: Visual Inspection, Magna flux, dye penetration test, sonic and ultra sonic test, radiography and eddy current test. Examples of selection of NDT and mechanical testing methods for selected components like crankshafts, gears, razor blades, welded joints, steel and C.I. casting, rolled products.

7. MACHINE TOOLS

Introduction to Machine Tools & Lathe Machine, Drilling Machines, Milling Machines Grinding Machines, Shapers, Planers and Slotters
Broaching Types of broaching machines. Parts of the machine and their functions. Components machined on broaching machine. Broach geometry.
Introduction to NC, CNC Machines- Introduction to NC, CNC, DNC machines. Machining centres- principles, working, advantages, and applications. Introduction to FMS.

8. DESING OF MACHINE ELEMENTS

Design Process, Statistical consideration in design, Manufacturing considerations in design, Aesthetic and ergonomic considerations in design of products, Design for variable stresses, Design of Machine Parts, Design of Cotter joint and knuckle joint, Mechanical Springs, Bending Of Curved Bar, Stresses in ring, chain link and crane hook, C-Clamp design. Design of piston rod, push rod, connecting rod.

9. HEAT TRSNSFER

Introduction, Fundamental equations of conduction, One dimensional steady state heat conduction, One dimensional steady state heat conduction with heat generation, Extended Surfaces, Unsteady state Heat Conduction, Convection, Dimensional an alysis, Forced Condensation and boiling.

10. METOLOGY AND QUALITY CONTROL

Introduction, Comparators, Interferometry, surface finish measurement Comparators, Metrology of Screw Thread, Gear Metrology, Interferometer, Surface Finish Measurement, Machine Tools Metrology, Advances of Metrology
Concept of Quality- Definitions of Quality, Dr. Deming and Juran”s Contributions, Elements/ Characteristics of Quality, Value of Quality, Cost of Quality, Quality Policy, Vision, Mission. Quality Control- Definitions, Scope and Applications, Quality Assurance, Causes of Variation.
Six Sigma- Types of Defects, DMAC, Six Sigma Program, Zero Defect
Quality Standards – ISO 9000:2001, TS 16949 Standard, FMECA (Failure Mode Effect Criticality Analysis), FTA (Fault Tree Analysis)
Quality Circle- Kaizen Practice, Cause and Effect Diagram, Pareto Analysis, Total Quality Management (TQM), Statistical Quality Control, Acceptance Sampling, Types of Sampling Plan.

11. MAINTENANCE ENGINEERING

Maintenance Basics, Types of Maintenance and maintenance organization, Maintenance Activities and Planning, Maintenance Quality Indices and Measurements, Maintenance Management, Spare Parts Management and Inventory Control

12. INTERNAL COMBUSTION ENGINES

Introduction to Engine, Petrol Engine System, Diesel Engine System, Engine Cooling Engine Performance and Testing, Air pollution and control, Introduction to New technologies.

13. POWER PLANT ENGINEERING

Introduction and scope of the MEA051, Present status of Power generation in India, power plants in INDIA.
Fuels for Power Plants
Solid Fuels- Coal and its various types, calorific values, properties, analysis of coal.
Liquid Fuels- Petroleum and its various types, calorific values, properties.
Gaseous Fuels- Natural gas and all other types, calorific values, properties.
Nuclear Fuels- Sources of nuclear fuels, energy levels, calorific values, properties.
Thermodynamics of combustion, combustion process, proximate and ultimate analysis of fuel, mass fraction, mole fraction, theoretical, excess and deficient air.
Thermal Power Plants, Steam Generators, Steam Nozzles, Condensers, Steam Turbines, Hydro Power Plants, Nuclear Power Plants, Diesel Power Plants.

14 INDUSTRIAL ORGANIZATION AND MANAFGEMENT

Overview of Business, Management Process, Organizational Management, Human Resource Management, Financial Management, Materials Management, Project Management.

APPENDIX -II

ELIGIBILITY CONDITIONS FOR APPEARING IN THE EXAMANATION

In order to be eligible to appear in the Competitive Examination, a candidate must satisfy the following conditions, namely:-

a). Age: Should have attained the age of 18 years but should not have attained the age of more than 30 years on the first day of the month of advertisement. The maximum age limit shall be relaxed up to 5 years in respect of candidates belonging to BL, SC & ST and 4 years for MBC candidates and 3 years for OBC Candidates. The upper age limit shall be relaxed up to 50 yrs.in respect of Group 'C' and 'D' persons working under the State Government Departments and under NHPC, other Central Government Establishment or Undertaking in the State of Sikkim, local employees who are working in Banks, Sikkim, Manipal, Sikkim University, Vinayak Mission and employees engaged By IT in Common Service Centres as Computer Operators on Muster Roll/ Ad-hoc/Substitute /Contract/ Work-Charged basis for the purpose of recruitment in the government Service.

b). Essential Qualification:

i) Diploma in Mechanical Engineering
Or

ii) Diploma in Mechatronics,
or

iii) Diploma in Tools and Die Making,
or

iv) Diploma in Manufacturing Technology alongwith Diploma in Mechanical Engineering (LME) for the educational and other qualification required for Direct recruitment in the post of Junior Engineer/ Foreman (Mechanical) Grade-II.

c). Other Requisites

i. Candidates must be in possession of either Sikkim Subject Certificate or Identification Certificate issued by the competent authority under relevant orders of the State Government.
ii. Local Employment Card holder.
iii. Should be conversant with the custom and usage of Sikkim.