PROFESSIONAL MATHEMATICS

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<th>Subject Code</th>
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<th>No of Periods in one session : 60</th>
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Rationale:
A technical diploma holder is engaged generally as first line supervisor. He forms a bridge between workers and management. He has to understand the language of the modern management and communicate with the workers in their language. This subject will help accomplish the task in stipulated time, develop attitude towards cost effectiveness, selection of most effective alternative methods. This course will also help the student to tackle different numerical methods and computational techniques for problem solving in research organization as a programmer.

Objective:
The course enables students to:

- Managerial skill based on mathematical footing
- The ability to find approximate solutions and/or answers to the problems where analytical methods become more complex.
- To choose correct numerical techniques for a given problem.

S.No. | Topics | Periods |
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<tr>
<td>01</td>
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<tr>
<td>02</td>
<td>GROUP-B (Statistical Techniques)</td>
<td>(20)</td>
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<td>03</td>
<td>GROUP-C (Management Techniques)</td>
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CONTENTS:

GROUP-A (NUMERICAL METHODS & COMPUTATIONAL TECHNIQUES)

01.01 Introduction to Numerical methods: Approximation and errors (Truncation & Round off). Floating, point presentation of numbers, arithmetic operations with normalized floating point.


01.03 Solution of Linear Simultaneous Equations: Gaussian Elimination method and Gauss-Jordan method.


01.05 Numerical Differentiation & Integration: Newton’s forward and backward differentiation formula. Trapezoidal Rule and Simpson’s 1/3 rule for numerical integration.

01.06 Numerical solution of 1st order ordinary differential equations: Taylor’s Series. Euler’s method. Modified Euler’s method Runge-Kutta methods.

GROUP-B (STATISTICAL TECHNIQUES)

02.01 Introduction to statistics: Measure of central tendencies: measures of dispersions: standard deviation and variance for discrete and grouped data: assumed mean and step deviation methods.


02.03 Probability Distribution: Introduction to Arithmetic Mean and Standard Deviation of a probability distribution. Important probability distribution – Binomial distribution. Poisson's distribution and normal distribution. Their means and variance.

02.04 Sampling Distribution: Sampling Distribution of Mean and Standard Deviation.

02.05 Quality Control: P-Chart and R-Chart.

GROUP-C (MANAGEMENT TECHNIQUES)

03.01 Linear Models
03.01.01 Introduction to Operations Research (O.R) Steps of O.R.
03.01.02 Linear Programming Problems: Step in information of a LPP. Mathematical Modelling and Solution Procedure.
03.01.03 Solution by Simplex Method: Basic Feasible Solution (Degenerator and Non-degenerator) Procedure including Big-M Method. Example.
03.01.04 Transportation problem: Introduction and Solution Procedure- (i) Finding the initial basic feasible solution by N-W Corner Rule and Vogel’s Approximation Method. (ii) Finding the Optimal Solution by U-V Method.
03.01.05 Assignment Problem: Introduction and Solution Procedure–Fundamental theory underlying Hungarian Method.
03.02 Network Analysis. CPM & PERT: Introduction.
03.02.01 Basic concepts – Activities. Nodes. Edges. Networking of a project. Various times calculations. CPM to determine the optimal project schedule.
03.02.02 PERT- Definition, difference between CPM & PERT. Pessimistic times, optimistic times. Most likely times of various activities, probability of meeting the schedule time, standard deviation of the schedule time.

Books Recommended: Text Books

SCHEME OF EXAMINATION FOR FINAL EXAMINATION F.M :80
Rationale:
The subject forms an important part of Engineering curricula for developing the concepts required in the design of various structures. The subject deals with the basic concept of mechanic of body and the behaviour of material used in practice and in structures under varying load conditions. The first part of the subject deals with the applied mechanics science. Which describe the condition of body in rest or motion under the action of forces. In its preview come variety of general and specialized engineering disciplines concerned with analysis of structures and machines and the mechanism of their parts.

In the Second part, the principles of strength of materials is introduced in which the student will learn to distinguish between different types of stress and strain and also the qualitative assessment of stress and strains in material element under the action of internal forces.

Objective:
Knowledge Workers will be able to:

- Analyze and understand the physical behaviour of members of engineering structures.
- Acquire knowledge of various elements of structures.
- Utilise the basic principles.
- Develop skill to tackle field problem.
- Solve the problems by the application of basic principles.
- Judge the suitability of materials in design process.

S.No. | Topics | PART-A | Periods
--- | --- | --- | ---
01 | Introduction | | (02)
02 | Vector Methods | | (02)
03 | Introduction to system of forces and equilibrium | | (06)
04 | Friction | | (04)
05 | Kinematics and kinetics of a particle | | (03)
06 | Kinematics and kinetics of rigid body | | (04)
07 | Impulse and Momentum | | (02)
08 | Work, Energy and Power | | (04)
Total : | | | (27)

PART-B

01 | Simple stress and strains | | (05)
02 | Elastic constants | | (03)
03 | Center of Gravity (Centroid) | | (05)
04 | Moment of Inertia | | (05)
05 | Shearing force and bending moments | | (05)
Total : | | | (23)

Total : | | | (50)

CONTENTs:
PART-A

**TOPIC: 01 – INTRODUCTION:**
Idealisation of mechanics; Concept of rigid body; External forces (Body forces & surface forces) Law of Mechanics.

**TOPIC: 02 VECTOR METHODS:**

Equality and equivalence of vectors, Free and Bound vector; Moment of a force about a point and a line; Couple and moment of a couple; couple moment as free vector. Wrench.

**TOPIC: 03 – INTRODUCTION TO SYSTEM OF FORCES AND EQUILIBRIUM:**
Statically equivalent force system; simplest equivalent of a system of forces; force analysis, free body diagram, equation of equilibrium.

**TOPIC: 04 – FRICTION:**
Types of friction (Static, Dynamic, Sliding, Rolling, Fluid) Rope & Belt Friction etc.

**TOPIC: 05 – KINEMATICS AND KINETICS OF A PARTICLE:**
Rectilinear and curvilinear translations; normal and tangential component of acceleration; radial and transverse component of acceleration.

**TOPIC: 06 – KINEMATICS AND KINETICS OF RIGID BODY:**
Angular Velocity and angular acceleration; Effective forces on a rigid body. D’ Alembert’s principle.

**TOPIC: 07 – IMPULSE AND MOMENTUM:**
Linear impulse and linear momentum, angular impulse and angular momentum.

**TOPIC: 08 – WORK, ENERGY AND POWER:**
Work done by forces and couples, potential and kinetic energy, work-energy; conservation of energy; concept of power and efficiency.

PART-B

**TOPIC: 01 – SIMPLE STRESSES & STRAIN:**

01.01 Definition of various terms and their units (S.I. Units)
01.03 Stress & strain in varying sectional bar & composite bar. Stress & strain due to temperature variation in homogeneous and composite bars.
01.04 Shrinking on hoop’s stresses.

**TOPIC: 02 – ELASTIC STRESS & STRAIN:**

02.01 Definition of various terms and their units (S.I. Units)
02.03 Stress & strain in varying sectional bar & composite bar. Stress & strain due to temperature variation in homogeneous and composite bars.
02.01 Linear strain and lateral strain, Poisson’s ratio, volumetric strain
02.02 Change in volume due to axial, biaxial & triaxial loading. Bulk modulus.
02.03 Shear stress and strain, modulus of rigidity.
02.04 Various relations between modulus of elasticity, modulus of rigidity & bulk modulus.
02.05 Simple shear. Complementary shear stress, stress on oblique section.

**TOPIC: 03 – CENTER OF GRAVITY (CENTROID):**

03.01 Definition of center of gravity & centroid.
03.02 Determination of C.G of various sections symmetrical and unsymmetrical sections.
03.03 Determination of C.G of perforated sections. C.G. of semi circle, quadrant circle.

**TOPIC: 04 – MOMENT OF INERTIA:**

04.01 Definition of M.I.; radius of gyration, second moment of area.
04.02 Parallel axis theorem & perpendicular axis theorem.
04.03 Derivation of M.I. of regular area-rectangular, triangular circular about centroidal axis.
04.04 M.I. of built up section, symmetrical and unsymmetrical about centroidal axis, modulus of sections.

**TOPIC: 05 – SHEARING FORCE & BENDING MOMENT:**

05.01 Types of beams and types of supports, types of loading.
05.02 Concept and definitions of shear force and bending moment, sign convention.
05.03 Shear force and bending moment diagrams for cantilever, simply supported beam, over hanging beam for various types of loading & couples, point of contraflexure.
05.04 Relation between B.M, S.F. and rate of loading.

**Books Recommended:**

**Text Books**


**SCHEME OF EXAMINATION FOR FINAL EXAMINATION**

F.M. : 80
Computers play a vital role in present day life, more so, in the professional life of technician engineers. In order to enable the students use the computers effectively in problem solving, this course offers the modern programming language C along with exposition to various engineering applications of computers.

Objective:

The objectives of this course are to make the students able to:

- Develop efficient algorithms for solving a problem.
- Use the various constructs of a programming language viz. conditional, iteration and recursion.
- Implement the algorithms in “C” language.
- Use simple data structures like arrays, stacks and linked list solving problems.
- Handling File in “C”.

S.No. Topics Periods
01 Introduction to Programming (03)
02 Algorithm for Problem Solving (08)
03 Introduction to ‘C’ Language (06)
04 Condition and Loops (06)
05 Arrays (06)
06 Functions (05)
07 Structures and Unions (05)
08 Pointers (05)
09 Self Referential Structures and Linked Lists (03)
10 File Processing (03)

Total (50)
**TOPIC: 09 – SELF REFERENTIAL STRUCTURES AND LINKED LISTS:**
Creation of a singly linked list, Traversing a linked list, Insertion into a link list, Deletion from a linked list.

**TOPIC: 10 – FILE PROCESSING:**
Concept of Files, File operation in various modes and closing of a file, Reading from file, Writing onto a file.

**Book Recommended:**


**SCHEME OF EXAMINATION FOR FINAL EXAMINATION**

F.M. : 80
Rationale:
A nation is strong if the industries are strong. A nation is self dependent if it produces its all requirements with its own resources and industry and should have the capacity to export materials in other countries.

A diploma holder technician has to play a vital role in industries. He has to work as a bridge in between Management and Labour.

An industry is rich if its workshop is rich. A workshop is rich if it has recent machines in good number and technical staffs (having good concepts) in sufficient no. A diploma holder technician plays a vital role in act and guidance inside a workshop.

Objective:
For building a diploma holder technician to be more practical with good concept of theories the paper Manufacturing Technology – I has been framed.

With the help of this paper a person will be able to get the almost all basic concepts of workshop.

The students will be able to:
(i) Know the basic principles of workshop.
(ii) Select materials, tools, equipments more speedily accurately.
(iii) Prepare a job as per requirement (either by casting of machining).
(iv) Check the qualities and specification of job, tools and equipments.
(v) Develop managerial skill.

S.No. | Topics                  | Periods
--- |-------------------------|--------
01   | Workshop Management     | (04)   
02   | Lathe                   | (16)   
03   | Shaper and Planner      | (09)   
04   | Drilling & Boring Machines | (05)  
05   | General Knowledge of Different Types of Machines | (04) 
06   | Welding                 | (10)   
07   | Pattern Making          | (08)   
08   | Moulding                | (07)   
09   | Casting                 | (06)   
10   | Metal Cutting           | (06)   
Total |                         | (75)   

CONTENTS:

**TOPIC: 01 – WORKSHOP MANAGEMENT:**
01.01 Rules and regulations of working in workshop (01)
01.02 Duties and responsibilities of Foreman (01)
01.03 Algorithm or flow diagram for competing a job in different sections of workshop (01)
01.04 A general knowledge of Iron. Coal. Tools used in different section. (01)

**TOPIC: 02 – LATHE:**
02.01 Introduction, terminology used in lathe: feed, depth of cut, cutting speed, R.P.M. of pass etc. (01)
02.02 Types of lathe, centre lathe, capstan lathe, turret lathe, automatic lathe of computer guided lathe (C.N.C. lathe) (02)
02.03 Constructional details of centre lathe. (02)
02.04 Specification of lathe. Difference between centre lathe & turret lathe. (03)
02.05 Operation on lathe – Turning (Cylindrical, toper), facing, drilling, boring, thread cutting, grinding etc – Numericals, (03)
02.06 Tools for each types of operation, special attachment & accessories on lathe. (01)
02.07 Sp. Operation on lathe using special attachment, indexing of turret & cross slide. (01)
02.08 Faults in lathe & its remedies. (01)
02.09 C.N.C. lathe – computer operation for C.N.C. lathe, merits of C.N.C over manually operated lathe. (02)
02.10 Visit to factory where C.N.C. is used. (01)

**TOPIC: 03 – SHAPER AND PLANNER:**
03.01 Introduction. Construction details of shaper. (02)
03.02 Quick return mechanism. (01)
03.03 Terminology used (feed. Depth of cut, no. of pass, R.P.M. stroke length cutting speed) (01)
03.04 Specification of shape. (01)
03.05 Troubleshooting. (01)
03.06 Difference between shaper and planner, Planner operation. Types of jobs prepared on shaper and planner, (02)
03.07 Numerical problems on shaper. (01)

**TOPIC: 04 – DRILLING & BORING MACHINES:**
04.01 Introduction, classification, specification. (02)
04.02 Tools, accessories, operation, difference in drilling & boring tools. (03)

**TOPIC: 05 – GENERAL KNOWLEDGE OF DIFFERENT TYPES OF MACHINES:**
05.01 General knowledge of broaching tools, slotting machine, its use. (01)
05.02 Grinding machines, nomenclature of grinding wheel’s abrasive material. (03)
TOPIC: 06 – WELDING:
06.01 Introduction, types. (02)
06.02 Description of Gas welding and electric welding, tools used in welding. (02)
06.03 Precaution in welding. (01)
06.04 Brazing & soldering. (01)
06.05 Flame theory: Colour, temperature O₂,C₂H₂ combination for welding & cutting. (02)
06.06 Welding rod, calculation of welding rod, oxygen/acylene in gas welding. Numerical problems. (02)

TOPIC: 07 – PATTERN MAKING:
07.01 Definition of pattern. General terms used in pattern making. (01)
07.02 Pattern making tools, pattern materials wood, metals like brass, aluminium, white metal, plastics etc. (03)
07.03 Types of pattern – Single piece, split, loose piece, geted cope and drag and shell patterns. (02)
07.04 Pattern allowance: shrinkage, finish and rapping or shake allowance. (02)

TOPIC: 08 – MOULDING:
08.01 Moulding tools and equipments, moulding machine, moulding materials, their types with compositions and characteristics. (02)
08.02 Moulding processes – Hand moulding and machine moulding, types of moulds, methods of moulding, bench moulding/book moulding, pit moulding, loam moulding and mouldings. (02)
08.03 Core binders, core boxes and core print, core preparation and setting of cores, core baking. (02)

TOPIC: 09 – CASTING:
09.01 Melting furnaces, Electric furnace. Coke fired furnaces, oil and gas fired furnaces and cupola furnaces, factors affecting selection of furnaces, sand casting process, use of special methods of casting, centrifugal casting, die-casting, investment casting & their areas of application. Advantages and disadvantages of these casting, clearing and testing of casting, Defects in casting and their remedies. (06)

TOPIC: 10 – METAL CUTTING:
10.01 Metal cutting theory, stages of cutting, factors affecting cutting, cutting speed calculation. (01)
10.02 Chip formation, types of chips, effect of built up edge formation upon surface finish, chip breaker. (02)
10.03 Cutting tool classification of cutting tool, tool geometry tool life. (02)
10.04 Tool wear, tool failure, types of cutting fluids & their properties with specific uses. (01)

Book Recommended:
1. Karyashala Takniki (Khand – I) - B.S. Raghuvanshi
   Dhanpat Rai & Sons, New Delhi
2. - R.K. Jain
3. Manufacturing - Begman

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

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<th>DISTRIBUTION OF MARKS</th>
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Subject Code: P15205

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Rationale:

A diploma holder technician in Mechanical Engineering has to encounter with the use of, and conversion of chemical energy into thermal energy, thermal energy into mechanical energy, waste products carrying heavy amount of useless energy into useful energy. Conversion of solar energy into different types of energies utilized in different plants, like railway, automobile etc.

The E.C.I. has been introduced in Diploma II to give the base for the conversion/utilization of technologies being used or to be used in different organisations.

Objective:

The objective of the course is to provide the basic concepts of the conversion of useless energy into useful energy so that students should be able to develop the new ideas about the energy and can be able to develop a new technology/advance technology to give more & more useful energy.

The basic concepts provide the following items:

(i) Knowledge of different types of energy.
(ii) Utilization of waste products/unutilized material into biogas or biomass.
(iii) Concept of wind mill.
(iv) Better utilization of abundant energy of the sun in the form of solar energy.
(v) Conversion of chemical energy into thermal energy.
(vi) Conversion of other types of energies into thermal energy.
(vii) Chemical capacity of traditional fuel.
(viii) Capacity of steam, use of steam table, molliers chart.
(ix) Production of steam.

( Knowledge of steam generators etc.)

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<th>S.No.</th>
<th>Topics</th>
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<td>01</td>
<td>Sources of Energy.</td>
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<tr>
<td>02</td>
<td>Heat Transfer for Solar Energy Utilization</td>
<td>(05)</td>
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<td>03</td>
<td>Solar Radiation Analysis</td>
<td>(06)</td>
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<td>04</td>
<td>Storage of Solar Energy</td>
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<td>Methods of Solar Energy</td>
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<td>06</td>
<td>Fuels and Combustion of fuels</td>
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<td>Thermodynamics</td>
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<td>Air Cycles</td>
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<td>09</td>
<td>Steam &amp; Steam Generators</td>
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CONTENTS:

**TOPIC: 01 – SOURCES OF ENERGY:**

01.01 Definition of energy, types of sources of energy (conventional & non conventional) (01)
01.02 Causes for evaluation of non-conventional energy, small description. (01)
01.03 Types of non-conventional energy & their resources. (02)
01.04 Availability of non-conventional energy and its usefulness. (01)
01.05 Description of wind mill, its types and performance. (02)
01.06 Bioconversion and Biomass (photo synthesis, biogas generation Materials for biogas, ocean. (02)
01.07 Thermal electric conversion (OTECE) – introduction only. (01)

**TOPIC: 02 – HEAT TRANSFER FOR SOLAR ENERGY UTILIZATION:**

02.01 Introduction, Conduction, Convection, Radiation, Reflectivity, Transmissibility, Heat exchanger. (03)
02.02 Problems of heat transfer through an insulated wall of pipe. (02)

**TOPIC: 03 – SOLAR RADIATION ANALYSIS:**

03.01 The characteristics of the sun. (01)
03.02 Solar constant, Solar Radiation at the earths surface. (02)
03.03 Determination of solar time, derived solar angles. (03)

**TOPIC: 04 – STORAGE OF SOLAR ENERGY:**

04.01 Types of energy storage (thermal storage, electrical storage, chemical storage, in the form of potential hydraulic energy (hydro storage). (06)

**TOPIC: 05 – METHODS OF SOLAR ENERGY UTILIZATION:**

05.01 Solar furnaces (01)
05.02 Solar pumping (01)
05.03 Solar distillation (01)
05.04 Solar cooking (02)
05.05 Solar green house (01)
05.06 Thermal-electric conversion (02)

**TOPIC: 06 – FUELS AND COMBUSTION OF FUELS:**

06.01 Fuels – Introduction, desirable properties of good fuel. (01)
06.02 Classification – Solid, Liquid, Gas. (01)
TOPIC: 07 – INTRODUCTION TO THERMODYNAMICS:
07.01 Basic concept of thermodynamics. Heat and Energy. Thermodynamic systems, closed system, open system, isolated system.
07.02 Properties of system and their classification. Properties of perfect gases. Different types of thermodynamic process.
07.03 Laws of gases and their characteristics equation. Specific heats of gases and their relation with gas constant, Representation of processes on P-V & T-Φ diagram.
07.04 Laws of Thermodynamics - 1st Law of Thermodynamics.
07.05 First Law of Thermodynamics, Statement, explanation & application. Non-flow energy equation (closed system), calculation of work done, Heat transfer and internal energy for different thermodynamic process.
07.06 Second Law of Thermodynamics, Statement, explanation & application.
07.08 Calculation of changes of entropy. Heat transfer to different thermodynamic system.

TOPIC: 08 – AIR CYCLES:
08.01 Definition of a Cycle, Cylinder Bore, Stroke ratio, Stroke length, Stroke Volume. Clearance, Clearance ratio, Compression ratio, Pressure ratio, m.e.p. and air standard efficiency.
08.02 Concept of reversible and irreversible processes and cycles.
08.03 Ideal Cycle (Carnot Cycle), Representation on P-V & T-Φ and H-Φ diagrams Derivation and Calculation of m.e.p. and air standard efficiency.
08.04 Otto Cycle, Representation on P-V & T-Φ and H-Φ diagrams. Derivation and Calculation of m.e.p. and air standard efficiency.
08.05 Diesel Cycle, Representation on P-V & T-Φ and H-Φ diagrams. Derivation and Calculation of m.e.p. and air standard efficiency.
08.06 Dual Cycle, Representation on P-V & T-Φ and H-Φ diagrams. Derivation and Calculation of m.e.p. and air standard efficiency.

TOPIC: 09 – STEAM AND STEAM GENERATORS:
09.01 Formation and properties of Steam.
09.02 Formation of steam at a constant pressure, constant temperature, constant volume. Total heat graph during steam formation.
09.03 Important terminology used for steam. Wetsteam, Super saturated steam. Dryness fraction, Latent heat of vaporization, Sensible heat of water.
09.04 Total heat of enthalpy of steam. Entropy of steam. Steam table and its use.
09.05 Use of Mollier’s chart.
09.06 Advantage of super heating. External work done during evaporation, Internal Energy of steam, Problems on properties of steam.
09.07 Steam generators, Introduction to steam generators, Classification of boilers.
09.08 Requirements of good steam boilers.

Books Recommended:
1. Solar Energy Utilization - G.D. Rai

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

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MACHINE DRAWING

Subject Code
P15206

<table>
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<th>Theory</th>
<th>No of Period in one session : 150</th>
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Rationale:
For a technician to work efficiently he must have a very sound knowledge of drawing. The main objective of framing syllabus of Machine Drawing is to make the technician well trained in drawing, so that he may be able to work in different fields such as in industry, department of sales or services or in the department of drawing and design etc.

Objective:
By going through the contents student will be able to:
(i) Understand drawing and develop capacity to represent any matter/object with the help of picture.
(ii) Develop primary knowledge of working drawing.
(iii) Produce orthographic drawing of different machine parts.
(iv) Develop skill to produce assembly drawings.
(v) Develop skill to produce detailed drawings of machines parts from assembly drawing.

S. No. | Topics | No of sheets | Periods |
--|--------|-------------|--------|
01 | Introduction | (01) | (12) |
02 | Free Hand Sketching of Machines Parts | (02) | (36) |
03 | Riveting | (01) | (09) |
04 | Nuts and Bolts | (01) | (06) |
05 | Conversion of Isometric Views into Orthographic Projection. | (02) | (21) |
06 | Sectional Views | (01) | (09) |
07 | Assembling of Different Machine Parts from Disassembled Views. | (02) | (30) |
08 | Disassembling of Machine Parts from Assembled Views | (02) | (24) |

CONTENTS:

**TOPIC:01 – INTRODUCTION:** [12]
1 Sheet
(i) Different types of lines
(ii) Different materials – Ferrous, non ferrous, atone, bricks, wood.
(iii) Limits & fits –
   (a) Selection of margin
   (b) Concept of g & H
   (c) Go and Not go gauge
   (d) Difference between theoretical drawing and actual drawing.
   (Conversion of drawing into job & job into drawing) (03)

**TOPIC:02 – FREE HAND SKETCHES:** [36]
2 Sheet
(i) Rules of free hand sketches & its use.
(ii) Concept of Sectioning, full sectioning, half sectioning, part sectioning.
(iii) Sketching of different machine parts i.e. knuckle joint, cotter joint, coupling (flange, flexible, universal). Bearing (All types i.e. journal, bush, pedestal, foot step etc.), Plumber block, Fast & loose pulley. (At Least 4 machine parts should be shown in each sheet) – (Not to the scale). (27)

**TOPIC:03 – RIVETTING:** [09]
1 Sheet

**TOPIC:04 – NUTS & BOLTS:** [09]
1 Sheet
Classification of nuts, terminology used in the drawing of nuts & bolts. Drawing of orthographic projections (Top view, Front view & Side view) of a bolt, imperical relations of dimensions of nut & bolt w.r.t. bolt head dia.

**TOPIC:05 – CONVERSION OF ISOMETRIC VIEW INTO ORTHOGRAPHIC PROJECTION (GENERAL):** [09]
2 Sheet

**TOPIC:06 - SECTIONAL VIEWS:** [07]
1 Sheet
Orthographic Sectional View of Piston of 2 stroke & 4 stroke I.C. Engine.

**TOPIC:07 - ASSEMBLING OF DIFFERENT MACHINE PARTS FROM DISASSEMBLED VIEWS:** [30]
2 Sheet
Expansion joint, cross head of steam engine, steam stop valve big end of connecting rod.

**TOPIC:08 - DISASSEMBLING OF MACHINE PARTS FROM ASSEMBLED ASSEMBLED VIEWS:** [24]
2 Sheet
Knuckle joint, coupling, (any one coupling) bearing (any one bearing), I.C. engine parts.
(At least 10 sheets should be done in sessional).
Books Recommended:


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Rationale:
Rapid technological developments in the fields of new materials and their alloys makes the selection of material difficult for engineers or technician. Adequate knowledge about properties of material like wear, abrasion, corrosion, structure, deformation of metals is essential. A brief knowledge about heat treatment of metals, its advantages and disadvantages is required for technicians. The syllabus of Material Science & Technology has been aimed to provide the students the knowledge of metal behaviour in different service conditions.

Objective:
The students will be able to:
(a) Know about metallic deformation.
(b) Corrosion, its prevention.
(c) Selection of suitable materials.
(d) Heat treatment processes.

S. No. | Topics                              | Periods |
-------|-------------------------------------|---------|
01     | Deformation of metals              | (07)    |
02     | Fracture of metals                 | (04)    |
03     | Corrosion of metals                | (06)    |
04     | Phase diagram & alloy system       | (08)    |
05     | Heat treatment                      | (10)    |
06     | Testing of materials               | (08)    |
07     | Shaping of metals                  | (09)    |

CONTENTS:

TOPIC: 01 – DEFORMATION OF METALS:
01.01 Introduction, classification of deformation, elastic and plastic, comparison between elastic & plastic deformation. (02)
01.02 Modes of plastic deformation slip and twinning. (02)
01.03 Dislocation theory: types of dislocation – edge and screw dislocation. (01)
01.04 Deformation of polycrystalline material, comparison between recovery and reerystallization. (02)

TOPIC: 02 – FRACTURE OF METALS:
02.01 Introduction, causes of fracture. (02)
02.02 Classification of fracture, brittle & ductile, comparison between brittle & ductile fracture. (02)

TOPIC: 03 – CORROSION OF METALS:
03.01 Introduction, mechanism & classification of corrosion. (02)
03.02 Factors influencing corrosion, prevention and control of corrosion (02)
03.03 Metallic & Non-metallic coatings for corrosion control. (02)

TOPIC: 04 – PHASE DIAGRAM AND ALLOY SYSTEM:
04.01 Introduction, allotropic forms of pure iron, critical points, iron-carbon system. (02)
04.02 Phase diagram for iron carbon system, solid phase in iron-iron carbide phase diagram, critical temperature eutectoid, hypereutectoid and hypereutectoid steels. (02)
04.03 Modified iron-iron carbide diagram, primary and secondary transformation in steel, micro-constituents of steel and cast-iron. (02)

TOPIC: 05 – HEAT TREATMENT:
05.01 Introduction (01)
05.02 Annealing (02)
05.03 Normalising (01)
05.04 Hardening (02)
05.05 Tempering (01)
05.06 Carburizing (02)
05.07 Advantages & disadvantages of heat treatment (02)

TOPIC: 06 – TESTING OF MATERIAL:
06.01 Introduction, classification of testing. (01)
06.02 Hardness testing – Brinel, Rockwel, Vickers diamond test (02)
06.03 Tensile Test (01)
06.04 Non-destructive tests. (02)

TOPIC: 07 – SHAPING OF METALS:
07.01 Introduction, classification of metal shaping processes (01)
07.02 Cold working processes – rolling, drawing, bending, shearing, squeezing shot peening, advantages and disadvantages. (04)
07.03 Hot Working – methods, rolling, drawing, welding, extruding, spinning, forging, advantage and disadvantages, comparison between cold working and hot working. (04)

SCHEME OF EXAMINATION FOR FINAL EXAMINATION
F.M. : 80
Rationale:

Technician has to understand the basic design principles of machines, mechanism and their parts. He comes across the problem of power transmission, speed control, braking, engagement and disengagement of power balancing etc.

The subject is being prescribed with a view to help the students to develop the knowledge and understanding of the mechanism and machines so that he will be able to develop skill which will help in solving the problems of design, power transmission, maintenance etc.

Objective:

The student should be able to understand:
- Different types of links & mechanisms.
- The problems of friction and their application.
- The principles of power transmission, gear, belt and rope drives.
- The braking system and their application.
- The function of different types of governors and flywheels.
- The design and working of cam.
- The principles of balancing.

S. No. Topics Periods

01 Simple Mechanism (06)
02 Friction (10)
03 Belt & Rope drives (09)
04 Gear drive & gas trains (10)
05 Governors (10)
06 Turning moments & flywheels (10)
07 Brakes & dynamometer (08)
08 Cams (08)
09 Vibration & Balancing (04)

CONTENTS:

TOPIC: 01 – SIMPLE MECHANISM:
01.01 Introduction, Kinematic links, types of links, structure, comparison between machine and structure.
01.02 Kinematic pairs, classification, types of constrained motion.
01.03 Kinematic pair, kinematic chain, their classification, mechanism, types of joints.
01.04 Number of degrees of freedom
01.05 Inversion of mechanism, inversion of single slider crank chain, crank and slotted bar quick return and Whitworth quick return motion mechanism.

TOPIC: 02 – FRICTION:
02.01 Introduction, classification, limiting friction, dynamic friction, co-efficient of friction, angle of repose.
02.02 Friction on rough inclined plane, laws of solid and fluid friction.
02.03 Screw friction, screw jack, torque required to lift and to lower the load by screw jack overhauling & self-locking screws, efficiency

TOPIC: 03 – BELET & ROPE DRIVE:
03.01 Introduction, classification of drives, materials used for belts.
03.02 Velocity ratio of compound belt drive, slip of belt creep of belt. length of open & cross belt drive.
03.03 Power transmitted by a belt, ratio of driving tension for flat belt drive centrifugal tension, condition for maximum tension in belt.
03.04 V-belt drive, advantages and disadvantages ratio of driving tension rope drive, numericals.

TOPIC: 04 – GEAR DRIVES:
04.01 Toothed Gearing, introduction, terminology, advantages and disadvantages, classification.
04.02 Gear trains, Simple gear trains, compound gear trains, velocity ratio.
04.03 Design of spur gear (to find no of teeth) problems.

TOPIC: 05 – GOVERNORS:
05.01 Introduction, function, terminology, classification with flywheel.
05.02 Watt governor, Porter & Proell governor.
05.03 Hartnell and Hartung governor.
05.04 Effort and power of a porter governor.
05.05 Hunting sensitivity and stability of governor, isochronous governor.

TOPIC: 06 – TURNING MOMENT & FLYWHEEL:
06.01 Introduction, turning moment diagram for a single cylinder double acting steam engine.
06.02 Turning moment diagram for a four stroke internal combustion engine.
06.03 Fluctuation of energy, determination of maximum fluctuation energy, co-efficient of fluctuation of energy.
06.04 Flywheel, co-efficient of fluctuation of speed, energy stored in a flywheel. Dimensions of the flywheel rim, Numericals.

TOPIC: 07 – BRAKES:
07.01 Introduction, materials for brake lining, classification.
07.02 Single block brakes, double block shoe brake.
07.03 Simple band brake, Differential band brake, Band and block brake, internal expanding brake.
07.04 Dynamometer, classification, Prony Brake & Rope Brake dynamometer. Numericals.
TOPIC: 08 – CAM:

08.01 Introduction, classification, terminology.
08.02 Displacement, velocity and acceleration diagrams when the follower moves with uniform velocity, simple harmonic.
08.03 Construction of cam profile for a radial cam, profile of cam when the axis of follower passes through the axis of cam shaft, profile of the cam when the axis of the follower is offset from the axis of the cam shaft.

TOPIC: 09 – VIBRATION & BALANCING:

09.01 Vibration, classification, natural frequency of free longitudinal and transverse vibrations.
09.02 Balancing, classification, balancing of single rotating mass by a single mass rotating in the same plane, balancing of a single rotating mass by two masses.

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 80
Rationale & Objective:

The reputation and success of any industry largely depends upon quality of its products. So, in modern industries, the whole plant has to contribute towards building quality to the product. As such, the concept of quality and its control has become one of the stringent requirements of modern industries. Hence, it is required to have a thorough understanding of the principle of the accurate and precise measurement techniques, concept of variability in measurement.

The subject “Metrology and Quality Control” aims at equipping the students with a strong foundation in metrology and quality control concepts and skills so that they can perform the job of an inspector and help the industries to produce quality products.

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<td>Instruments and Gauges for testing straightness, flatness, Squareness, parallelism etc.</td>
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<td>02</td>
<td>Quantity function in Industry</td>
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<td>03</td>
<td>Fundamentals of Statistical Concept in Quality Control</td>
<td>(03)</td>
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<td>04</td>
<td>Control Charts in S.W.C.</td>
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<td>Sampling Inspection</td>
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<td>Operation Characteristics (OC) Curve</td>
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CONTENTS:

PART – A

TOPIC:01 – ELEMENTARY METROLOGY: [04]
01.01 Definition of metrology
01.02 Objective of metrology
01.03 Precision and accuracy
01.04 Accuracy and cost
01.05 Sources of errors
01.06 Concept of Repeatability, Sensitivity, Readability and Reliability

TOPIC:02 – LINEAR MEASUREMENT: [04]
02.01 Introduction
02.02 Vernier Calipers – reading the vernier scale.
02.03 Vernier micrometers (Description of various parts and their specification)
02.04 Vernier Height Gauges, Depth gauges
02.05 Slip Gauges

TOPIC:03 – ANGULAR MEASUREMENT: [04]
03.01 Introduction
03.02 Vernier and optical Bevel protractor
03.03 Sine Principle and Sine Bars
03.04 Optical Instruments for angular measurement
03.05 Angle Gauges
03.06 Calibration of angle gauges.

TOPIC:04 – COMPARATIVE MEASUREMENT: [05]
04.01 Comparators
04.02 Characteristics of Comparators
04.03 Uses of comparators
04.04 Classification of comparators
04.05 Advantages and disadvantages of mechanical, optical, electrical and pneumatic comparators.
04.06 Working Principle of optical and pneumatic comparators.

TOPIC:05 – INSTRUMENTS AND GAUGES FOR TESTING STRAIGHTNESS, FLATNESS, SQUARENESS, PARALLEISM ETC: [04]
05.01 Definition straightness, flatness of surface, parallelism
05.02 Testing of straightness, flatness & parallelism
05.03 Measurement of circularity

TOPIC:06 – LIMITS, FITS AND GAUGES: [04]
06.01 Introduction
06.02 Concept of Tolerances, Interchangeability
06.03 Terms associated with an assembly basic size, normal size limits, deviation and zero line.
06.04 Methods of Timit systems – hole basis and shaft basis.
PART – B

TOPIC:01 – INSPECTION: [02]
01.01 Introduction & Definition of Inspection
01.02 Principle of Inspection
01.03 Inspection stages
01.04 Floor Inspection advantages & disadvantages

TOPIC:02 – QUALITY FUNCTION IN INDUSTRY: [02]
02.01 Concept of quality
02.02 Quality of design, conformance & performance
02.03 Concept of reliability and maintainability
02.04 Factors affecting quality
02.05 Quality circles – basic concept, purpose & functioning

TOPIC:03 – FUNDAMENTALS OF STATISTICAL CONCEPT IN QUALITY CONTROL: [03]
03.01 Types of variations
03.02 Types of quality characteristics variable, attribute and variable treated as attribute
03.03 Terminology used in frequency distribution
03.04 Graphical presentation of frequency distribution (Histogram, Frequency Bar Char, Frequency Polygon)
03.05 Normal distribution Curve – Description and its construction.

TOPIC:04 – CONTROL CHARTS IN S.Q.C.: [02]
04.01 Introduction to X-R Chart
04.02 Steps required to construct X-R Chart
04.03 Analysis of X and R Chart
04.04 Concept of process capability
04.05 Control Charts for percent defective p-chart
04.06 Application of p-chart.
04.07 Introduction of e-chart
04.08 Construction of e-chart and its analysis

TOPIC:05 – SAMPLING INSPECTION: [06]
05.01 Purpose of sampling inspection
05.02 Procedure of sampling inspection
05.03 Different types of sampling inspection
05.04 Advantages & Disadvantages of sampling
05.05 Application of sampling plan
05.06 Single sampling Double sampling and Sequential sampling plan

TOPIC:06 – OPERATION CHARACTERISTICS (OC) CURVE: [04]
06.01 Definition and explanation of an OC Curve.
06.02 Different parameter of OC Curves
   (Producer’s risk, consumer’s risk. Acceptance Quality Level (AQL) etc.
06.03 Zone of acceptance, rejection & indecision
06.04 Relationship between the parameters of OC-Curves.

Books Recommended:
2. Quality Control - Khanna Publishers
   - T.T.T.I. Madras
   - Tata McGraw Hill Publishing Ltd.
3. Industrial Organisation - T.R. Banga
   - Khanna Publishers
4. Inspection & Quality Control - National Productivity Council

SCHEME OF EXAMINATION FOR FINAL EXAMINATION F.M. : 80
HYDRAULICS & FLUID MECHANICS

Subject Code
P15210

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Rationale:
Water Management has a prime importance in the development of any country. This management covers the qualities of drinking water, its viability, controlling of flow of water, its pressure calculation, different effects produced on the objects by it. The energy associated with it i.e. Hydraulic energy & its use. Now a day it is a great task to control the flood and desert. A diploma holder technician must have the capacity to control the natural hazards occurred due to water or to develop new cultivated area from desert lands. Seeing the today's requirement this paper, fluid mechanics has been designed.

Objective:
The student should be able to:
(i) Analyse the difference of drinking and not drinking water and should know the principles to convert not drinking water into drinking water.
(ii) Measure pressure to ensure safe working of submerged objects.
(iii) Calculate the specific gravity & wet of fluid on/in an object.
(iv) Assess the requirements of service water for the house.
(v) Maintain & regulate the flow of fluids in a pipe line. And at last should have the basic concepts of almost all types of problems related to water.

S. No. | Topics | Periods
---|---|---
01 | Basic Concepts of Fluids | (13)
02 | Hydrostatic Forces on Surfaces | (07)
03 | Buoyancy & Floatation | (07)
04 | Hydro Kinematics & Dynamics | (09)
05 | Orifice | (05)
06 | Loss of Head | (05)
07 | Mouthpieces & Pipes | (07)
08 | Hydraulic Gradient | (06)
09 | Branching of Pipes & Transmission of Power Through Pipes | (08)
10 | Impact of Jet & Water Wheels | (08)

CONTENTS:

**TOPIC:01 – BASIC CONCEPTS OF FLUID:**
01.01 Fluid (Definition & its types). Formula for Newtonian Fluid Concept of hydraulics/ F.M. classification of hydraulics Hydrostatics, hydro kinematics. [03]
01.02 Water Analysis – Drinking and not drinking water, impurities of water (temperature & permanent), conversion of not drinking water into drinking water (Biological, Chemical & Mechanical processes only). [04]
01.03 Properties of Water – Specific gravity, surface tension, viscosity, cohesion-adhesion. [01]
01.04 Types of Pressures – Atmospheric gauge, vacuum, vapour etc. & its units. Pressure measuring instruments – Barometer, Simple Manometer. Differential Manometer, Inverted manometer, Enlarged End Manometer – Numerical problems. [02]
01.05 Mechanical gauges – Borden tube, diaphragm, dead weight pressure. [01]
01.06 Types of flow – Stream, streak, uniform, non-uniform, steady, unsteady, laminar, turbulent, compressible, incompressible, rotational, irrotational, path line, streamline, stream tube – definition only, Reynolds No. & its application in laminar & turbulent flow over a plate. [02]

**TOPIC:02 – HYDROSTATIC FORCES ON SURFACES:**
02.01 Total Pressure and Centre of Pressure, pressure at a point in a liquid, centre of pressure, total for on-horizontal surface area, vertical surface area & inclined surface area. Practical application on Centre of Pressure, Pressure diagram. Resultant Pressure, Sluice gate, lock gate, masonry wall and dam. [07]

**TOPIC:03 – BUOYANCY AND FLOATATION:**
03.01 Principles of buoyancy and floatation, Uses of principles of floatation, Conditions of equilibrium of floating bodies – Stable unstable and natural, metacentre, determination of metacentric height by experimental method & analytical method – Numerical problem. [07]

**TOPIC:04 – HYDROKINEMATICS & DYNAMICS:**
04.01 Equation of continuity of flow – Discharge of rate of flow & its units. Equation of continuity of flow. Potential or static head, static energy, pressure head and pressure energy, kinetic head and kinetic energy, conversion of one energy into another energy. [09]
04.02 Bernoulli’s theorem and its proof – Numerical problems. Practical application of Bernoulli’s theorem, venturimeter, pitot tube, measurement of flow through pipes with the help of venturimeter (horizontal or inclined). Derivation of formula for the discharge, venture constant, Numerical problem.

**TOPIC:05 – ORIFICE:**
05.01 Definition & types, Vena contracta, Cc, Cv, C0 – Relation among them. Practical application – Numerical problem. [05]

**TOPIC:06 – LOSS OF HEAD:**
06.01 Loss of head due to sudden enlargement and sudden contraction, Derivation of formula, head loss at entrance & exit of pipe, loss of head due to obstruction in the path of flow (formula derivation), its practical use – Numerical problem. [05]

**TOPIC:07 – MOUTHPIECES AND PIPES:**
07.01 Difference between pipe and mouthpieces. Use of mouthpieces, friction loss in pipes, definition of pipes and channels, Wetted perimeter, hydraulic mean depth, loss of head due to friction in pipes. Chezy’s Equation, Chezy’s Constant, Darcy or Weishback Equation, Darcy’s Coefficient, Value of frictional coefficient for new and old pipes, water requirement for an area (house, colony, town, industry). [07]
TOPIC: 08 – HYDRAULIC GRADIENT:

08.01 Hydraulic Gradient line, total energy line for simple and compound pipes. Discharge through pipes, Free discharge, discharging in another vessel through simple and compound pipes. Equivalent size of compound pipes. Siphon – Definition and uses, Negative pressure, Starting of Siphon, Numerical problem.

TOPIC: 09 – BRANCHING OF PIPES & TRANSMISSION OF POWER THROUGH PIPES:

09.01 Pipes in parallel, discharge through each pipe, Flow through a diversion or bypass, branching of pipes. Flow through each pipe.
09.02 Hydraulic transmission of power through pipes, its practical uses.
09.03 Nozzle – definition flow through nozzle at the end of the pipe line. Transmission efficiency and maximum available H.P. Determination of dia of nozzle for supplying maximum horse power.

TOPIC: 10 – IMPACT OF JET & WATER WHEELS:

10.01 Introduction force of the jet impinging normally on fixed plate, hinged plate, moving plate and on a series of moving vanes, Force of the jet on a fixed curved vanes and on a moving curved vanes – Numerical problem.
10.02 Introduction, types of water wheel overshot, under shot and breast water wheel. Power available by each type of wheel, advantages and disadvantages of water wheels. Development of water turbines.

Books Recommended:

2. Fluid Mechanics & Hydraulic Machines - R.K. Bansal
3. Hydraulics & Hydraulic Machines - Dr. Jagdish Lal

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

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ENGINEERING MECHANICS Lab.

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Rationale & Objectives:
The Engineering Mechanics Laboratory is a subject which will help technician to understand the application of theory that he has studied in practice by performing experiments and verifying results.
Besides the above the objective of the curriculum with effective skill will be developed in them to observe experimental data, and to analyses the results.
These topics of this curriculum will certainly build their confidence in performing the utilization of principle of mechanics in Civil Engineering works.

CONTENTS:
Eight experiments to be performed in the laboratory:

1. Determination of elongation of wire under external load.
2. Tensile Test on mild steel specimen.
3. Tensile Test on high tensile specimen.
4. Compression Test on metal.
5. Compression Test on bricks.
7. Determination of reaction at the support of beam.
8. Determination of bending moment of a simply supported beam.
9. Determination of reaction at the support of roof truss.
10. Determination of deflection of beams.
12. Determination of bending moment of a over hanging beam.
13. Verification of Polygon Law of forces.
14. Verification of Triangle Law of forces.
15. To find moment of inertia of fly wheel.
16. Compression Test on metal.
17. Tensile Test on M.S.specimen.
18. Determination of co-efficient of friction on inclined plane.

Books Recommended:

Text Books

1. vfHk; kaf=d ; kaf=dh
2. Strength of Materials
4. Strength of Materials
6. Teaching plans of Strength of Material

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

| F.M. : 40 |
COMPUTER PROGRAMMING THROUGH ‘C’ Lab.

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内部考试：

| 00 | 00 | 03 | 内部考试： |

50

List of Practicals:
1. Programming exercise on executing a C program.
2. Programming exercise on editing C program.
3. Programming exercise on defining variables and assigning values to variable.
4. Programming exercise on arithmetic and relational operations.
5. Programming exercise on arithmetic expressions and their evaluation
6. Programming on infix, postfix, transformation using stack.
7. Programs on insertion, deletion on link list.

Books Recommended:

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

F.M. : 40
WORKSHOP PRACTICE

Rationale & Objective:
A Diploma holder technician should get more opportunity to know about machines, equipments & its operations which will help to be more confident & practical.

S. No. Topics Periods
A Machine Shop
B Welding Shop
C Foundry Shop
D Fitting Shop

CONTENTS:

TOPIC:A – MACHINE SHOP:
A.01 Safety precautions, Machine cleaning, checking, making ready for operation. Selection of tools, preparing it in ready condition (tool sharpening)
A.02 Lathe:
Setting of job on three jaw, four jaw check, centering, tool/tools fitting, adjustment of tail stocks (if required).
Practice of operations: Turning, facing, taper turning on sample jobs. Job configuration checking.
Preparing a job by above processes (Sessional Preparation)
A.03 Shaper:
Study of quick return mechanism.
Repair of faults (minor) in machines.
Tool setting on Ram.
Practice of feed depth of cut, no. of pass on sample job.
Preparation of V block on a sample job.
A.04 Drilling:
Checking of drill bit.
Making of sample blind hole.
Making hole in a tapered job/V block.

TOPIC:B – WELDING SHOP:
B.01 Safety precautions, handling of tools & equipment.
B.02 Gas welding: Flame adjustment, practical on welding, soldering & brazing on two parts (sample job).
B.03 Electric welding:
(i) Flame adjustment, use of electrodes on jobs (T- shape, L-shape), Coarse & fire welding.
(ii) Preparation of chair & grill.

TOPIC:C – FOUNDRY SHOP:
C.01 Tools, cope, drag. Different types of pattern – introduction & use.
C.02 Preparation of foundry sand.
C.03 Demonstration & handling of mould (A sample mould should be prepared by teacher/Institute)
C.04 Preparation of different types of moulds using single piece, spit or any available pattern – at least 3 moulds should be prepared by each student.
C.05 Taking photographs of different moulds prepared by students.
C.06 Non-Fe Casting of one of the above.

TOPIC:D – FITTING SHOP:
D.01 Tools – Introduction & its use.
D.02 Different processes (Sawing, filing, drilling, tapping, diceing, scraping, reaming etc.)
D.03 Different types of fitting – Round fitting, Square fitting, Triangular fitting etc.
D.04 Use of above D.02 & D.03 on sample jobs, L-shape, T-shape etc.
D.05 Practical Use of fitting.
D.06 Preparation of threads in pipes using tap & die – sessional preparation.

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

<table>
<thead>
<tr>
<th>Types of Questions</th>
<th>DISTRIBUTION OF MARKS</th>
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<tr>
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<td>Test Knowledge</td>
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<td>Long Answer type</td>
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Rationale & Objective:

A Diploma holder technician should be able to command the concepts of machines through vigorous practice by copying, plotting, orthographic-isometric conversion, different fastening devices, assembly & disassembly etc.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Topics</th>
<th>No. of Sheets</th>
<th>Periods</th>
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<tbody>
<tr>
<td>01</td>
<td>Introduction</td>
<td>(01)</td>
<td>(12)</td>
</tr>
<tr>
<td>02</td>
<td>Free Hand Sketching of Machines Parts</td>
<td>(02)</td>
<td>(36)</td>
</tr>
<tr>
<td>03</td>
<td>Riveting</td>
<td>(01)</td>
<td>(09)</td>
</tr>
<tr>
<td>04</td>
<td>Nuts and Bolts</td>
<td>(01)</td>
<td>(06)</td>
</tr>
<tr>
<td>05</td>
<td>Conversion of Isometric Views into Orthographic Projection.</td>
<td>(02)</td>
<td>(21)</td>
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<tr>
<td>06</td>
<td>Sectional Views</td>
<td>(01)</td>
<td>(09)</td>
</tr>
<tr>
<td>07</td>
<td>Assembling of Different Machine Parts from Disassembled Views</td>
<td>(02)</td>
<td>(30)</td>
</tr>
<tr>
<td>08</td>
<td>Disassembling of Machine Parts from Assembled Views</td>
<td>(02)</td>
<td>(24)</td>
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<td></td>
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<td>(150)</td>
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</tbody>
</table>

CONTENTS:

**TOPIC: 01 – INTRODUCTION:**

01.01 Representation of:

(i) Different types of lines
(ii) Different materials – Ferrous, non ferrous, atone, bricks, wood.
(iii) Limits & fits –

a) Selection of margin
b) Concept of g & II
c) Go and Not go gauge
d) Difference between theoretical drawing and actual drawing (Conversion of drawing into job & job into drawing)

**TOPIC: 02 – FREE HAND SKETCHES:**

02.01 (i) Rules of free hand sketch & its use.
(ii) Concept of sectioning, full sectioning, half sectioning, part sectioning.
(iii) Sketching of different machine parts i.e. knuckle joint, cotter joint, coupling (flange, flexible, universal), Bearing (All types i.e. journal, bush, pedestal, foot step etc.), Plumber block, Fast & loose pulley. (At least 4 machine parts should be shown in each sheet) - (Not to the scale)

**TOPIC: 03 – REVETTING:**

03.01 Introduction of shapes of rivet heads. Caulking & fullering, pitch. Diagonal pitch, margin, back pitch etc. types of riveting (lap & butt joint, zig zag & chain structure, Boiler joint.

**TOPIC: 04 – NUTS & BOLTS:**

04.01 Classification of nuts, terminology used in the drawing of nuts & bolts. Drawing of orthographic projections (Top view, Front view & Side view) of a bolt, imperative relations of dimensions of nut & bolt w.r.t. bolt head dia.

**TOPIC: 05 – CONVERSION OF ISOMETRIC VIEW INTO ORTHOGRAPHIC PROJECTION (GENERAL):**

**TOPIC: 06 – SECTIONAL VIEWS:**

06.01 Orthographic Sectional View of Piston of 2 stroke & 4 stroke I.C. Engine.

**TOPIC: 07 – ASSEMBLING OF DIFFERENT MACHINE PARTS FROM DISASSEMBLED VIEWS:**

07.01 Expansion joint, cross head of steam engine, steam stop valve big end of connecting rod.

**TOPIC: 08 – DISASSEMBLING OF MACHINE PARTS FROM ASSEMBLED VIEWS:**

08.01 Knuckle joint, coupling, (any one coupling) bearing (any one bearing), I.C. engine parts.

At least 10 sheets should be done in sessional
(As far as possible, proper sheets should be provided by Institution to avoid level difference & confusion.).

Books Recommended:

Rationale & Objective:
A Diploma holder technician (Mechanical) should be able to handle types of machines and can think about the better use of modification of the machines.

<table>
<thead>
<tr>
<th>Sl. No.</th>
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<tbody>
<tr>
<td>A</td>
<td>Applied Mechanics Laboratory</td>
<td></td>
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<tr>
<td>B</td>
<td>Hydraulics Laboratory</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Energy Conversion Laboratory</td>
<td></td>
</tr>
</tbody>
</table>

CONTENTS:

**TOPIC:A – APPLIED MECHANICS LABORATORY:**

At least five experiments to be done:
A.01 Verification of Law of Parallelogram of Forces.
A.02 Verification of Hooke’s Law by Searl’s Apparatus.
A.03 To find modulus of rigidity of M.S. Rod by Torsion method.
A.04 To find the reaction at supports for a simply supported beam having point loads at different position and Draw S.F. and B.M.
A.05 To find the moment of inertia of a fly wheel.
A.06 To determine stiffness of a spring and its modulus of rigidity.
A.07 To find the maximum deflection of a simply supported beam and cantilever beam having point load at the middle and the free end respectively.
A.08 To find the reactions at fixed end and draw S.F. and B.M. diagram having point loads at free end.

**TOPIC:B – HYDRAULICS LABORATORY:**

At least five experiments to be done:
B.01 Determination of $C_v$, $C_f$, $C_d$ of discharge through Orifice.
B.02 Determination of Metacentric height of a Ship. (Experimental method),
B.03 Verification of Bernoulli’s Equation,
B.04 Friction Loss in pipes
B.05 Discharging through notch.
B.06 Hardness test of (different types of samples) water.
B.07 Conversion of non-drinking water into drinking water.

**TOPIC:C – ENERGY CONVERSION LABORATORY:**

At least four experiments should to be done, in which, Experiment No. C.01 is compulsory:
C.01 Study of Solar devices:
   a) Solar Cooker  
   b) Solar Street Lighting System  
   c) Solar Pumping  
   d) Solar Heating & Cooling System  
   e) Solar Drier  
   f) Any device which uses solar energy,  
      (At least one device should be prepared by group of students)
C.02 Detailed study of Gobar Gas Plant
C.03 Working of 2 stroke/4 stroke I.C. Engines.  
C.04 Study of Boilers (Water tube/ Fire tube)
C.05 Calculation of I.H.P., B.H.P., of a Heat Engine
C.06 Troubleshooting of Water Cooler/Refrigerator.
C.07 Visit to Factory/Power Plant for knowing about steam generation & its utilization.
Rationale & Objective:
A Diploma holder technician should get more opportunity to know about machines, equipments & its operations which will help him to be more confident & practical.

Sl. No. | Topics | Periods
---|---|---
A | Machine Shop | 
B | Welding Shop | 
C | Foundry Shop | 
D | Fitting Shop | 

**CONTENTS:**

**TOPIC:A – MACHINE SHOP:**

A.01 Safety precautions, Machine cleaning, checking, making ready for operation. Selection of tools, preparing it in ready condition (tool sharpening)
A.02 Lathe:
   (i) Setting of job on three jaw, four check, centering, tool/tools fitting, adjustment of tail stocks (if required).
   (ii) Practice of operations: Turning, facing, taper turning on sample jobs. Job configuration checking.
   (iii) Preparing a job by above processes (Sessional Preparation)
A.03 Shaper:
   (i) Study of quick return mechanism.
   (ii) Repair of faults (minor) in machines.
   (iii) Tool setting on Ram.
   (iv) Practice of feed depth of cut, no. of pass on sample job.
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