**Electrical Technology GPI Battagram**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.No** | **Module/Trainer/Description** | **Qty** | **Unit Rate** | **Total Cost** |
| 01 | **DC Fundamental trainer along with module and base unit to perform following topics :**   * Circuit Voltage, Current, Resistance * DC Power Sources in Series and in Parallel Series * Opposing DC Sources * Switches Identification and Switching Concepts * Ohm’s Law: Circuit Resistance, Current, & Voltage * Resistance, Voltage and Current in a Series Resistive Circuit * Resistance, Voltage and Current in a Parallel Resistive Circuit * Resistance, Voltage and Current in a Series-Parallel Resistive Circuit * Power in a Series and/or Parallel Resistive Circuit * Rheostat and Potentiometer * Voltage and/or Current Dividers * Measuring: DC Ammeter, DC Ohmmeter, DC Voltmeter * Currents and Node Currents in a Two-Element Branch Circuit * Voltages in a Three-Element Series Circuit * Algebraic Sum of Voltages in a Series Circuit * Generating Loop Equations and Node Equations * Kirchoff’s Voltage and Current Laws with a Two-Source Circuit * Mesh Solutions, Superposition Solution and Millman's Theorem Solution of a Two-Source Circuit * Thevenizing a Single-Source Network and a Dual-Source Network * Thevenin Resistance (RTH) and Voltage (VTH) of a Bridge Circuit * Thevenin-to-Norton Conversion * Norton-to-Thevenin Conversion * Tee and Wye or Pi and Delta Networks * Transformation of Delta and Wye Networks * Troubleshooting Basics and DC Networks   **(With complete accessories and instruction manual)**  Or  **Equivalent** | 01 |  |  |
| 02 | **AC Fundamentals Trainer along with module and base unit to perform following topics :**   * Measuring AC Voltage, Current and Impedance * Measuring and Setting Frequency * Inductors, Phase Angle, Series vs Parallel, Inductive Reactance and Impedance * Series and Parallel RL Circuits * Electromagnets, Solenoid, Relay * Transformer Windings, Mutual Inductance, Turns and Voltage Ratios, Secondary Loading * Capacitors, Series vs Parallel, Capacitive Reactance * Series and Parallel RC Circuits * RC Time Constants * RC/RL Wave shapes * Series and Parallel RLC Circuits * Series Resonant Circuits * Q and Bandwidth of a Series/Parallel RLC Circuit * Resonant Frequency in a Parallel RLC Circuit * Power Division and Power Factor * Filters: Low-Pass, High Pass, Band-Pass and Band-Stop   **With complete accessories and instruction manual)**  Or  **Equivalent** | 01 |  |  |
| 03 | **Solid state Semiconductor Trainer along with module and base unit to perform following topics:**   * Semiconductor Component Identification and Control of a Semiconductor Switch * Diode: DC Characteristics, Diode Waveshaping * Rectifiers: Half-Wave, Full-Wave Diode Bridge, Power Supply Filtering, Voltage Doubler * Zener Diode and Voltage Regulation * Transistor: Testing the Junctions, PNP Transistor Current Control Circuit, Emitter-Base Bias Potentials, Collector Current vs Base Bias, DC Circuit Voltages, Load Lines * Semiconductor Devices Circuit Board * Multistage Amplifier Introduction * Common Base, Common Elmitter and Common Collector Circuits AC/DC Operation * Temperature Effect on Fixed Bias Circuit and Voltage Divider Bias Circuit * Transistor Parameters Familiarization and Understanding the Specification Sheet * RC Coupled Amplifier DC Operation, AC Voltage Gain and Phase Relationship, Frequency Response * Transformer Coupled Amplifier AC/DC Operation, Frequency Response * Direct Coupled Amplifier AC/DC Operation , Frequency Response * Amplifier Circuits * Single-Ended Power Amplifiers: Introduction, DC Operation, AC Operation, Voltage Gain, Power Gain * Phase Splitter DC Operation * Voltage Gain and Input/Output Signal Phase Relationship * Push-Pull Power Amplifiers: DC Operation, AC Operation, Voltage and Power Gain * Complementary Power Amplifiers: DC Operation, AC Operation, Voltage Gain and Power Gain * Darlington Pair Current Gain Characteristics, Input and Output Impedance * Oscillators Operation: Unijunction, Hartley, Colpitts * JFET: Operating Characteristics, Effect fo Gate Bias on Pinch-Off, Dynamic Characteristics, DC Amplifier Operation, Voltage Gain, DC Current Source Operation and Power/Load Voltage Variation * MOSFET: Zero Bias Characteristic, Modes of Operation, Voltage Amplifier, Dual Gate MOSFET Mixer * UJT: Operating Characteristics, Waveform Generation * Thermistor and Photoresistor Operation * Fiber Optic Light Transfer   (**With complete accessories and instruction manual)**  Or  **Equivalent** | 01 |  |  |
| 04 | **Thyristors And Power Control Trainer along with module and base unit to perform following topics:**   * Thyristor: Component Familiarization, Circuit Fundamentals * Silicon Controlled Rectifier (SCR): Testing, DC Operation, Gate Trigger Voltage and Holding Current * Rectifiers: Half-Wave Rectifier, SCR Controlled Half-Wave Rectifier, Full-Wave Rectifier, Phase Control * UJT: Characteristics, Half and Fuill-Wave Phase Control * Bidirectional Conduction, Triggering Modes (4)   **With complete accessories and instruction manual)**  Or  **Equivalent** | 01 |  |  |
| 05 | **Digital Logic Fundamentals Trainer along with module and base unit to perform following topics :**   * Component Location and Identification * Operation of General Circuits and IC Package Fundamentals * Logic Functions:AND, NAND, OR, NOR, Exclusive OR, NOR Gates * Dynamic Response of XOR/XNOR Logic Gates * DC Operation of a NOT and an OR-TIE * Transfer Characteristics of a Schmitt and a Standard LS TTL Gate * Flip-Flops: Set/Reset, D-Type, Statik JK, Dynamic Operation * Tri-State Gate: Output Enable Control, Sink and Source Control * TTL and CMOS: Static Trigger Levels, Dynamic Transfer Characteristics * Static and Dynamic Control of a Data Bus * Component Location and Identification * Operation of General Circuits and IC Package Fundamentals * Basic Counter Control Functions, Ripple Counter Waveforms, Synchronous Counter Circuit Waveforms and Glue Logic * Basic Operating Modes of the Shift Register * Shift Register Circuit Waveforms * Fundamental Binary Addition, Addition with Input and Output Carry * Fundamental Binary Comparisons * Comparators and Counter Modulus Control * Circuits * Component Location and Identification * Operation of General Circuits and IC Package Fundamentals * Fundamentals: BCD Decoder Operation, Priority Encoder Operation, ADC Operation, DAC Operation * Data Selector, Multiplexer, 1-Line-to-8-Line Demultiplexer * 1-Line-to-8-Line Demultiplexer * LED Decoder/Driver, 7-Segment LED Display, ODD and EVEN Parity * ODD and EVEN Parity * Parity Generator/Checker Glue Logic * Circuits and Digital Circuits   **With complete accessories and instruction manual)**  Or  **Equivalent** | 01 |  |  |
| 06 | **Digital logic trainer Breadboard based**   * Input Logic switches * Output LED’s * Power supplies * Seven segment displays * TTL and CMOS provision * Clock Signals * Connecting wires * Breadboard size: 2400 tie points or above   **( Along with all standard accessories mention in the brochure and instructional manual and Student manual)** Or  **Equivalent** | 2 |  |  |
| 07 | **Analog Trainer Breadboard Based**   * Breadboard size: 2400 tie points or above * Function generator (sine , square, Triangle, and Ramp * Fixed and variable power supplies ±0~25V, ±12V, +5V   **( Along with all standard accessories mention in the brochure and instructional manual and Student manual)** | 02 |  |  |
| 8 | **PLC Trainer**  DC output:  Voltage: 0 – 24V  Current: 0 – 2A  Ac Output:  Voltage: 220V  Current: 1 Amp  Input/output terminals is 32 or above  Memory: 32K or above  Internal memory: 2K  Timer/counter: 128/64  Base Module: Din Rail  Power supply module: input:120/230 V (AC)  Output: 24 V DC/5 A  PC interface: USB or Ethernet  With software supported (LAD, FBD, and STL).  Accessories: Connection cords, PC cable, ac power cord, Program CD, Manual.  PLC Application Modules:   * Traffic Lights * Electro-Pneumatics * Electro-Mechanical – DC Motor * Electro-Mechanical – Stepper Motor * Level Process Control   Or  **Equivalent** | 01 |  |  |
| 9 | **Analog Dual Trace Oscilloscope, 40 MHz:**  The module should include CH 1, CH 2, CHOP, and ALT display modes, an operating instruction manual, one line cord, and two low-capacitance probes.  **(With complete accessories and instruction manual)**  Or  **Equivalent** | 02 |  |  |
| 10 | **Laboratory Instruments demonstration type:**  The Laboratory Instruments module should consist of the following devices.   * DC meter * Sine/square wave generator * Electronic volt-ohm-millimeter (VOM) * AC/DC power supply   **(With complete accessories and instruction manual)**  Or  **Equivalent** | 01 |  |  |
| 11 | **Digital Function Generator**  20MHz, Sine, Square, Ramp, Noise waveform Amplitude, DC Offset and other key setting information shown on the 5~8 digit display  **(With all accessories mention in the brochure and instructional manual)**  Or  **Equivalent** | 02 |  |  |
| 12 | **Digital storage oscilloscope**  100 MHz Bandwidth with 2 Input Channels with color display.  **(With all accessories mention in the brochure and instructional manual)**  Or  **Equivalent** | 02 |  |  |
| 13 | **Digital Multimeter with dual measurement displays (Bench Type)**  DC Voltage :100 mV ~ 1000V DC Current: 100μA ~ 10A  Resistance : 100Ω ~ 100 MΩ  AC Voltage: 100mV ~ 750V  AC Current: 100mA ~ 10A  Power Source: 230 V  **(With all accessories mention in the brochure and instructional manual)**  Or  **Equivalent** | 03 |  |  |
| 14 | **Digital Clamp on meter:**  AC Amp: 200A  AC Vtg: 600V  DC Vtg: 600V  Ohms: 20MΩ  **(With complete accessories and instruction manual)**  Or  **Equivalent** | 5 |  |  |
| 15 | **Digital Multimeter (Hand Held):**  DC Voltage : 1000 V  DC Current: 10A  Resistance : 20 MΩ  AC Voltage: 600 V  AC Current: 10 A  **(With complete accessories and instruction manual)**  Or  **Equivalent** | 5 |  |  |
| 16 | **Digital LCR Meter bench type**  Resistance : 0.00001Ω ~ 99999kΩ  Capacitance: 0.00001pF ~ 99999uF  Inductance : 0.00001mH ~ 99999H  Quality Factor : 0.0001 ~ 9999  Impedance : 0.00001Ω ~ 99999kΩ  **(With all accessories mention in the brochure and instructional manual)**  Or  **Equivalent** | 04 |  |  |
| 17 | **Multiple output Dual range DC power supply:**  0 ~ 30V x 2, 0~5amp x 2  **(With complete accessories and instruction manual)**  Or  **Equivalent** | 01 |  |  |
| 18 | **Single and 3-phase Transformer Trainer:**   * Input single phase: 220~260vac, 2amp * Input 3 phase: Phase ~ phase 380 ~ 440vac, 2amp (phase ~ neutral) * Output single phase: 80%, 90%, 100%, and 110% * Output 3 phase: 80%, 90%, 100%, and 110%. * Distribution Transformer * Single-Phase Transformers Supplying Single-Phase Loads * Single-Phase Paralleling * 3-Phase Paralleling * Efficiency calculation of each transformer * Open/no load test * Load/Short circuit * Polarity test * Three-Phase Banking of Single-Phase Transformers   Or   * **Equivalent** | 01 |  |  |
| 19 | **Motor Winding Kit:**   * Equipment Familiarization * Split-Phase Capacitor-Start Motor * Three-Phase Squirrel Cage Induction Motor * DC compound motor * Motor Winding machine with counter * Coil winding range up-to 8 inch * All motors should be without winding   **(With complete accessories and instruction manual)**  Or  **Equivalent** | 02 |  |  |
| 20 | **Electricians Tool belt Tool Kit 13Pcs:**(One kit for each student)  5m/16" ST tape measure, 125-250V AC mains tester, junior hacksaw, 210mm pocket level, electricians knife, 160mm combicutter, 170mm snipe nose pliers and 185mm combination pliers; 5 x screwdrivers (PZD 2 x 100mm, SLP 2.5 x 75mm, SLP 5.5 x 125mm, SLP 6.5 x 150mm).  **(With complete accessories and instruction manual)**  Or  **Equivalent** | 30 set |  |  |

**Civil Technology GPI Battagram**

**SURVEYING**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.NO** | **Name of Items/Specification** | **Qty** | **Rate** | **Total Amount** |
| **1** | Ranging rods, | 5 |  |  |
| **2** | Engineer’s chain | 5 |  |  |
| **3** | Gunter’s chain | 5 |  |  |
| **4** | Metric chain | 4 |  |  |
| **5** | Cross staff, | 5 |  |  |
| **6** | line ranger, | 5 |  |  |
| **7** | Optical square, | 5 |  |  |
| **8** | Measuring tapes | 5 |  |  |
| **9** | Prismatic compass with stand. | 5 |  |  |
| **10** | Surveyor’s compass | 5 |  |  |
| **11** | Plane table with all accessories | 5 |  |  |
| **12** | **AUTOMATIC LEVEL**  SEPCIFICATION:  I)Magnification………………..32 x  ii)Aperture…………………….45 mm  iii)Compensator range………….+12’  ACCESSORIES:  a) Instrument  b) Instructional manual  c) Plumb Bob  d) Lens cap  e) Heavy Duty Aluminum Tripod Stand  f) Double sided Aluminum Staff pole.  Or **Equivalent** | 2 |  |  |
| **13** | **LEVELING STAFF.**  Aluminum folding type. | 10 |  |  |
| **14** | **LASER LEVEL.** | 01 |  |  |
| **15** | **ELECTRONIC THEODOLITE WITH ALL ACCESSORIES.**   * Accuracy 5 sec * Aperture 45 mm * Angle measuring mode Absolute encoder * Tilt sensor Automatic vertical compensation * Display 5 sec/ 2 sec * Magnification 30x * Measurements 175mmxL170xH334mm   ACCESSORIES.   * Lens cap * Lens brush * Battery case * Instructional Manual * Carrying case * Aluminum tripod.   Or **Equivalent** | 02 |  |  |
| **16** | **TOTAL STATION WITH ALL ACCESSORIES**  Electronic total station which combines in one compact unit a 5-second digital read out with an electronic distance meter, with the following specification:-  Angle Accuracy…………… 5 Seconds  Plummet………………… Laser  Guide light………………… In Built  On Board software….. Power Tope light installed  Distance with Single Prism. 7 KM  Distance with ripple Prism. 9 KM  In Built Internal Memory: 10,000 Points  Auto: Atmospheric Correction: In built.  Key Board ……………. Alpha Numeric  Reflector- less range... 500 M and above  TS shield. (Telecommunicated)  SD Card……………………….Built in  USB Slot………………………Built in  ACCESSORIES:  a)Battery Pack  b)Battery Adopter  c)Plumb Bob  d) A set of Tools.  e)Rain Cover  f)Carrying Case  g)Operational Manual  h)Heavy Duty Aluminum Tripod  i)Single Prism  j)Prism Holder  k)Coaxial Target Plate  l)Prism Pole  Or **Equivalent** | 02 |  |  |
| **17** | **GPS (Garmin).** | 02 |  |  |

**BUILDING’S CONSTRUCTION AND P.H.E.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.no** | **Name of Items/Specification** | **Qty** | **Rate** | **Total Amount** |
| **1** | Trowel, | 05 |  |  |
| **2** | Spirit Level, | 05 |  |  |
| **3** | Plumb Bob, | 05 |  |  |
| **4** | Shovel | 05 |  |  |
| **5** | concrete mixer | 05 set |  |  |
| **6** | Pipe wrench, pipe grip, pipe rammer, | 05 |  |  |
| **7** | pipe vice, | 05 |  |  |
| **8** | pipe thread set, | 05 |  |  |
| **9** | pipe tapes, | 10 |  |  |
| **10** | pipe cutter, | 05 |  |  |
| **11** | cutter wheel, | 01 |  |  |
| **12** | pliers adjustable, | 5 |  |  |
| **13** | Level Aluminum, | 5 |  |  |
| **14** | Square Steel, | 10 |  |  |
| **15** | Steel Drill, | 02 |  |  |
| **16** | Mason’s Drills, | 02 |  |  |
| **17** | Hacksaw, | 5 |  |  |
| **18** | hammer Ball, | 12 |  |  |
| **19** | Files (flats, Round, Triangular). | 10 set |  |  |
| **20** | Safety equipments(work gloves, boots, glasses, overall, dust mask/ respirator) | 01 set |  |  |
| **21** | Screw driver set | 05 set |  |  |
| **22** | Wheel barrow | 01 |  |  |
| **23** | Sealing tapes/ sealants | 10 |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **WOOD WORK SHOP PRACTICE FOR ONE INSTITUTE** | | | | |
| **S.No** | **Revised Specification** | **Quantity Required ( for One Institute)** | **Rate per Unit** | **Total amount** |
| 1 | **Work Benches.**  Made up of hard wood (sheesham, chine wood)  Local Best quality  1320mmx560mmx838mm Wood tops thickness 32 mm with wooden leg 102mm square. Or  **Equivalent** | 10 No |  |  |
| 2 | **Bits Auger.**  6mm to 25mm Bits auger consisting of 13 bits 6mm to 25mm. Local Best quality Or  **Equivalent** | 10 No |  |  |
| 3 | **Bits Auger.**  Square hole bit auger  Best quality  Bits made up of tool steel  Double square  6mm to 12.5 mm  Local Best quality  6mm 10mm 12.5mm 19mmMade of tool steel double square. Or  **Equivalent** | 10 No |  |  |
| 4 | **Bits Expansive and Adjustable.**  Hinge boring bits  15 to 35mmBits expansive and adjustable, boring from 15mm to 5mm. Local Best quality Or  **Equivalent** | 10 No |  |  |
| 5 | **Countersink drill bits**  For brace and wood, 12.5 mm diameter  Local Best quality Or  **Equivalent** | 10 No |  |  |
| 6 | **Screw driver bits**  Local Best quality  4.75mmBits screwdriver 4.75mm for brace. Or  **Equivalent** | 10 No |  |  |
| 7 | **Screwdriver.**  Local Best quality  6mmScrewdriver, 6mm for brace and wood. Or  **Equivalent** | 10 No |  |  |
| 8 | **Screwdriver bits.** Local Best quality  8mm,15mmBits screwdriver, for brace& wood. Or  **Equivalent** | 10 No |  |  |
| 9 | **Gimlet bits. Local Best quality**  2 Size No2,3 Size No3,4 Size No4,5 Size No5  6 Size No6,7 Size No7,8 Size No8 Or  **Equivalent** | 10 No |  |  |
| 10 | **Bits Brace.200mm Bits** brace 200 mm sweep ″Alligator″ Jaw chromed. Local Best quality Or  **Equivalent** | 10 No |  |  |
| 11 | **Bits (Machine)**.9.5mm 12.5mm 9mm, 25mm Bits Machine for wood. Local Best quality Or  **Equivalent** | 10 No |  |  |
| 12 | **Twist Drills.1.5mm to 13 mm**  Twist Drills straight shank. Local Best quality Or  **Equivalent** | 05 No |  |  |
| 13 | **Hand Drill , Local Best quality**  Voltage = 200 V  50 Hz  Power = 600-800 W  Chuck = keyless / keyed  Made up of hardened steel  Drilling capacity: for wood = 30 mm, for metal = 13 mm  Speed 3000 rpm  Body: high quality plastic  CE/ANSI/ISO 9001  Battery hand drill (rechargeable) Or  **Equivalent** | 05 No |  |  |
| 14 | **Vice. Local Best quality**  Made of cast iron/ high density steel  Jaw width x opening = 10-12’’ x 10-14’’  Throat depth = 3-5 ‘’  Overall length = 20-30 ‘’  Quick release mechanism  Swivel base Or  **Equivalent** | 05 No |  |  |
| 15 | **Curving set chisel**  Made of high carbon steel  Blade shape: curved with moderate radius between 20-30 deg.  Blade length = 4-6 ‘’  Blade width = ½-1’’  Handle material = hard wood (hickory or ash)  Handle length = 6-8’’  Bent gauge  Made of high carbon steel  Blade shape: bended approx.. 45 deg  Blade length = 4-6 ‘’  Blade width = ½-1’’  Handle material = hard wood (hickory or ash)  Handle length = 6-8’’  u-tool skew chisel  Made of high carbon steel  Blade shape: skew with u-shaped cross-section  Blade length = 4-6 ‘’  Blade width = ¼ -3/4’’  Handle material = hard wood (hickory or ash)  Handle length = 6-8’’  veining tool  Made of high carbon steel  Blade shape: V-shaped  Blade length = 4-6 ‘’  Blade width = 1/8-1/4’’  Handle material = hard wood (hickory or ash)  Handle length = 6-8’’  Handle design = taper for control  forged stool blades  Made of high carbon steel  Blade shape: flat, round and angled  Blade length = 6-10‘’  Blade thickness= 1/8-1/4’’  Handle material = hard wood (hickory or ash)  Handle length = 6-8’’ Or  **Equivalent** | 6 No |  |  |
| 16 | **Chisels**  Made of high carbom steel  Edge type: beveled mirror finish  Blade LxWxAngle:75-150mm x 6,12,19,25 x25 deg  Handle material: hard wood/best quality plastic  Handle length = 100-150 mm  Ferrule : solid brass  Storage: protective case/roll up pouch  Brand: Narex, stanely, Bahco Or  **Equivalent** | 12 No |  |  |
| 17 | **Wood chisel**  Bench chisel, paring chisels, mortise chisel, firmer chisel.  Made of high carbon steel  (58-62 HRC)  Handle material: hard wood/best quality plastic  Blade bevel 25 deg.  Ferrule : brass  Safety: edge protection grip  striking surface: steel Or  **Equivalent** | 10 No |  |  |
| 18 | **Marking Gauge**  - Beam length: 150-200 mm  - Stock dimensions: 70× 50× 20 mm  - Thumbscrew diameter: 20 mm  - Scribe pin diameter: 3-4 mm  Mortise Gauge  - Beam length: 200-250 mm  - Stock dimensions: 80× 50× 20 mm  - Adjustable scribing pins (2): 3-4 mm diameter each  - Thumbscrew diameter: 20 mm  Depth Gauge  - Beam length: 150-200 mm  - Base dimensions: 50× 30× 10 mm  - Vernier scale resolution: 0.05 mm or finer  Sliding Bevel Gauge  - Blade length: 150-250 mm  Handle dimensions: 100× 40× 20 mm  - Locking screw: Brass, 20 mm diameter  Combination Square  - Ruler length: 300 mm  - Ruler width: 25 mm  - Handle dimensions: 120 mm × 80 mm × 20 mm  - Spirit level: Integrated, bubble size 8-10 mm  Angle Gauge (Digital)  - Beam length: 200-250 mm  - LCD display: 50 mm × 25 mm  - Angle measurement range: 0-360 degrees  - Accuracy: ±0.2 degrees  Thickness Gauge (Feeler Gauge)  - Blade lengths: 100-150 mm  - Blade thicknesses: From 0.05 mm to 1.00 mm, in various increments  - Total blades: 10-20 pieces Or  **Equivalent** | 10 No |  |  |
| 19 | **Polished hammer**  Heat treated  Overall length = 12-14’’  Head wt=450-560gm  Face dia=1-1.5’’  Made of high carbon steel  Hammer handle : hard wood/fiber glass  Face : slightly convexed/flat Or  **Equivalent** | 10 No |  |  |
| 20 | **Plane Overall length 14-15’’**  Blade width=2-2.5’’  Plane Made of cast iron  Blade made of high carbon steel  Handle knob: hardwood (rosewood, beech) Or  **Equivalent** | 10 No |  |  |
| 21 | **Plane**. **Hand operated**  L = 22-24’’  Width = 2 ½-3’’  Height of knob & tote =6’’  Blade width = 2 1/2-2 5/8’’  Plane Made of cast iron  Blade material: high carbon steel  Handle knob made of hardwood  Adjustable frog  Anti-rusting coating  Chips breaker/cap iron Or  **Equivalent** | 10 No |  |  |
| 22 | **Rabbit plane**  Made of high cast iron  Handle made of hardwood  Overall LxWxH = 10x2.5x5’’  Blade width = ½-2’’  Blade thickness = 1/8-1/4’’  Sole thickness = ¼”  Adjustable & removable blade  Sharp bevel cutting edge  Fence to guide plane  Screw base adjustment Or  **Equivalent** | 10 No |  |  |
| 23 | **Smooth plane**  Body material: cast iron  Blade material: high carbon steel  Handle material= hardwood  Overall LxW= 9-10’’x2-2.5’’  Blade WxT = 2-2.5’’x0.12-0.14’’  Polished finishing Or  **Equivalent** | 10 No |  |  |
| 24 | **Plane** Body material: cast iron  Blade material: high speed steel  Handle material= hardwood  Base dimension LxWxT= 10-12’’x4-6’’x0.2-0.3’’  Blade LxW=3-4’’ x 0.5-1’’  Polished finishing Or  **Equivalent** | 10 No |  |  |
| 25 | **Block plane**  Overall LxWxH = 6-7’’x2-2.5’’x2-3’’  Cast iron body  Blade made of high carbon steel  Blade WxT = 1-1.5’’x 1/8-3/16’’  Angle 12 deg or 20 deg  Grip + non-slip sole Or  **Equivalent** | 10 No |  |  |
| 26 | **Rules.**Made of hadwood/metal  LxW=1000-1500mm x 40-60 mm  Beveled / squared edges  Hanging sole  End caps  Non-slip base Or  **Equivalent** | 10 No |  |  |
| 27 | **Shrink rule**  Smooth finish  Laser engraved marking  Metric/imperial  LxWxT = 12,18,24’x1-1.5’x0.08-0.10’  Straight edge  End hole Grip Or  **Equivalent** | 10 No |  |  |
| 28 | **Coping saw**  Steel frame 40x40 mm with welded joints  LxWxH = 1500x750x900 mm  Powder coated  Smooth finish  Work surface  LxWxT = 1500x750x25 mm, MFD made  Saw mounting:  300x300 mm, include heavy duty clamp Or  **Equivalent** | 10 No |  |  |
| 29 | **Coping saw**  High carbon steel or bi-metal  Blade dimension: LxWxT = 6.5x1/8-1/4x0.020-0.035’  TPI = 15-18  Sets 0f 10 or 20 blades Or  **Equivalent** | 10 No |  |  |
| 30 | **Back saw**  Blade length = 10-14 ‘’  Blade made of High carbon steel or SS  Blade T = 0.02-0.03’’  TPI = 12-15  Hardwood handle  Back reinforcement = brass/steel  Overall wt= 0.68 – 1.13 kg  Handle grip Guard Or  **Equivalent** | 10 No |  |  |
| 31 | **Compass saw**  LxWxT = 6-12’’x1/2-3/4’’x0.02-0.04’’  High carbon steel  TPI 10-14 cross-cut  Wt=0.23-0.45kg  ISO certified Or  **Equivalent** | 10 No |  |  |
| 32 | Saw. Local Best quality  660mm Hand Saws, coarse cut 8 TPI | 10 No |  |  |
| 33 | Saw. Local Best quality  140mm & 660mm Saw hand rip. | 10 No |  |  |
| 34 | Saw.300mm 14 TPI. Local Best quality | 10 No |  |  |
| 35 | Saw. Local Best quality  225mmHand saw coarse cut. | 10 No |  |  |
| 36 | Mitre Box.608mm x 127mmMitre box including eleven point stiff back saw, adjustable angle capacity at right angle 200 mm at 45 degree, 125mm. Local Best quality Or  **Equivalent** | 10 No |  |  |
| 37 | Miter Machine.660mm x 100mm Mitre machine including vice clamps stiff back fine tooth saw for picture frame and molding cutting. Local Best quality | 10 No |  |  |
| 38 | Screw Driver. Size 1, 2, 3, 100mm shank 6mm blade 150mm shank 6mm blade 225mm shank 6mm blade. Screw drivers. Local Best quality  Or  **Equivalent** | 10 No |  |  |

**SOIL** **MECHANICS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.no** | **Name of Items/Specification** | **Qty.** | **Rate per Unit** | **Total amount** |
| 1 | STAINLESS STEEL DRYING OVEN,  50 liters capacity  Temperature controlled. Maximum temperature range 200 C0 Or  **Equivalent** | 01 |  |  |
| 2 | 1). ELECTRONIC DIGITAL BALANCE.  (set of four balances)   * 1. 20 kg with accuracy of 1 gm   2. 5 Kg with accuracy of 0.1 gm   3. 1 kg with accuracy of 0.01 gm   2). Solution balance with 20 kg capacity. Or  **Equivalent** | 01 |  |  |
| 3 | MOISTURE CONTENT TIN 90 g Capacity. Or  **Equivalent** | 10 |  |  |
| 4 | SPEEDY MOISTURE TESTER  Standard: ASTM D 4944  For accurate moisture reading on site of soil, sand, aggregates. The test system arrives by the reaction between water and calcium carbide forming a gas. Complete with electronic balance, reagent tin, accessories; the whole contained in a portable molded case.  Capacity 6 gm Moisture Range 0-20% Or  **Equivalent** | 01 |  |  |
| 5 | MOTORISED CASAGRANDE APPARATUS.  ASTM D 4318,  Complete with mechanical stroke counter, smooth with adjustable falling height and normalized base.  Accessories.   1. Cassagrande grooving tool according to ASTM.   Spatula made in stainless steel 120 mm blade. Or   1. **Equivalent** | 01 |  |  |
| 6 | SHRINKAGE LIMIT APPARATUS  ASTM D 427,  Glass plate, with three metal prongs. Porcelain dish Ø 150mm , Flexible spatula with 120mm blade length, Shrinkage dish Ø 42x12mm (2), glass crystallizers Ø 57x32 mm, Graduated cylinder 25 ml capacity, 1 Kg of mercury and carrying case. Or  **Equivalent** | 02 |  |  |
| 7 | PLASTIC LIMIT: ASTM D 4318  Set for Plastic limit   1. Glass plate: 300mm squarex10 mm thick, 2. Metal rod Ø 3x100 mm length 3. Porcelain dish Ø 100mm 4. Flexible spatula with 120mm blade length. 5. Aluminum can (6) Ø55x35 mm   Carrying case. Or   1. **Equivalent** | 02 |  |  |
| 8 | PYKNOMETER.  ASTM D 854,  1 liter capacity, manufactured of glass and non corrodible brass cone lid. Or  **Equivalent** | 03 |  |  |
| 9 | Standard sieves set , ASTM C 33-13  (for fine and Coarse aggregates):  Of Ø 200 mm x 50 mm with hole With compatible electromagnetic sieve shaker. Or  **Equivalent** | 01 |  |  |
| 10 | CORE CUTTER APPARATUS  Cylindrical core cutter 10 cm diameter and 12.7cm high  Dolly/collar 2.5 cm high, Steel rammer. Or  **Equivalent** | 02 |  |  |
| 11 | SAND REPLACEMENT METHOD ASTM 1556  ( In-situ density) ASTM-Ø 6”.  CALIBRATED SAND (50 kg).  5 l. CAPACITY PLASTIC CONTAINER.  4” (102 mm) CONE.  BASE PLATE WITH Ø 4 “FLANGED HOLE.  6” (152 mm) CONE.  BASE PLATE WITH Ø 6” FLANGED HOLE   * BS 1377, 1924   SAND CONE WITH UPPER CYLINDER Ø 100 mm.  BASE PLATE WITH Ø 100 mm. FLANGED HOLE.  CALIBRATING CONTAINER Ø 100 mm.  SAND CONE WITH UPPER CYLINDER Ø 150 mm.  BASE PLATE WITH Ø 150 mm. FLANGED HOLE.  CALIBRATING CONTAINER Ø 150 mm.  TOOLS FOR IN-STU DENSITY TESTS   1. PLASTIC BOTTLE, CAPACITY 5 l. 2. CANVAS GLOVES. 3. RUBBER GLOVES. 4. PLASTIC BOTTLE, CAPACITY 250 ml. 5. PLASTIC BOTTLE, CAPACITY 500 ml. 6. PLASTIC BOTTLE, CAPACITY 1000 ml. 7. RUBBER BASKET, 12 LITRES CAPACITY. 8. RUBBER BASKET, 18 LITRES CAPACITY. 9. 2 x 2 m. BLANKET TO EXTEND SAMPLES. 10. 5 cm. WIDE FLAT BRUSH. 11. DENSITY CHISEL, 300 mm, LONG. 12. DENSITY PICK. 13. RUBBER MALLET. 14. FLAT SCOOP. 15. SMALL ROUND SCOOP. 16. SPOON. 17. LADLE. 18. TROWEL. 19. TROWEL 60 X 140 mm.   STEEL MALLET. Or   1. **Equivalent** | 01 |  |  |
| 12 | PERMEAMETER:   * FALLING HEAD PERMEAMETER   (Suitable for clays and silts tests).  The apparatus consists of a Ø 4”permeability cell, a stand pipe panel complete with 3 glass tubes with reference scales, a plastic de-airing tank and a metallic container for the saturation of the cell. Cell diameter: 101.6 mm. (4”). Or  **Equivalent** | 01 |  |  |
| 13 | CONSTANT HEAD PERMEAMETER, BS 1377   * (For granular soils, such as gravel and sand.)   Complete with the following elements:  - Support panel with 9 monomeric tubes, complete with nipples for the cell connection.  - Constant level tank with outlet inlet, outlet and overflow nipples.  - Cell made of transparent plastic material. Provided with 9 connectors for pressure inlet on 3 different levels.  - Dimensions: Ø 90 x 330 mm. h.  - Connection tube (20 m). Or  **Equivalent** | 01 |  |  |
| 14 | DIRECT SHEAR TEST APPARATUS.  ASTM-D3080,   * DIRECT/RESIDUAL SHEAR APPARATUS   The shear apparatus can test 60 x 60 mm. or 100 x 100 mm. square specimens and cylindrical Ø 60 x 20 mm.  The shear strength is applied by means of a motor and a drive with infinitesimal adjustment of the test speed, with control system fully digital and liquid crystal digital LCD. The vertical load is applied to the specimen through a counter-balanced loading lever, ratio 10:1. The motor can be easily reversed so that residual strength tests can be carried out. The carriage which contains the two knifes of the shear box is made of non-corrodible material and is mounted on special ball tracks. The input of test parameters is carried out by means a keyboard and alphanumeric display, thus granting infinitesimal resolutions in short times. Capacity 300 KN proving ring lever arm with ratio 10:1 Set of 50 kg weights and two 10x0.01 mm dial gauges.  MAIN FEATURES OF DIRECT SHEAR APPARATUS   * Adjustable shear speed between 0.0001 and 3 mm/min. * Max. Shear load: 5000 N. * Vertical load ratio: 10:1. * Max. Vertical load: 500 N. * Max. Vertical load with lever arm: 5500 N. * Shear box and accessories made in brass. * Power supply: single phase 220-240 V. 50 Hz. * 300 KN. Capacity proving ring, lever arm with ration 10:1, set of 50 kg. Weights and two 10 x 0.01 mm. dial gauges.   Accessories and Spare Parts:   * SET OF 50kg WEIGHTS,   manufactured in steel painted:  (4 x 10 kg; 1 x 5 kg; 2 x 2 kg; 1 x 1 kg).  Spare weights:   1. CALIBRATED WEIGHT of 10 kg. 2. CALIBRATED WEIGHT of 5 kg. 3. CALIBRATED WEIGHT of 2 kg. 4. CALIBRATED WEIGHT of 1 kg. 5. CALIBRATED WEIGHT of 0.5 kg. 6. CALIBRATED WEIGHT of 0.250 kg. 7. SHEAR BOX for round specimens of Ø 60 x 20 mm. 8. POROUS DISC, Ø 60 mm. 9. HOLLOW PUNCH, Ø 60 mm 10. SHEAR BOX for square specimens of 60 x 60 mm. 11. SQUARE POROUS STONES, \_ 60 x 60 mm. 12. SQUARE HOLLOW PUNCH, \_ 60 x 60 mm. 13. SHEAR BOX for square specimens of 100 x 100mm. 14. SQUARE POROUS STONES, \_ 100 x 100 mm. 15. SQUARE HOLLOW PUNCH, \_ 100 x 100 mm. 16. PROVING RING, 5 KN. Capacity. 17. DIAL GAUGE of 10 x 0.01 mm. 18. DIAL GAUGE of 30 x 0.01 mm.   Or Equivalent | 01 |  |  |
| 15 | STANDARD, PROCTOR COMPACTION TEST APPARATUS. ASTM D 558.   * MOULD.   Made of corrosion protected steel. Complete with base plate and collar.   * Accessories:   COMPACTION RAMMER (ASTM) Army type 2. 5 kg, made of corrosion protected steel. Diameter: 50.8 mm. (2”). STRAIGHT EDGE with handle.  STRAIGHT EDGE without handle Or  **Equivalent** | 01 |  |  |
| 16 | MODIFIED PROCTOR COMPACTION TEST APPARATUS ASTM D 698   * MOULD.   Made of corrosion protected steel. Inside diameter: 152.4 mm. (6”).   * Accessories:   BASE PLATE FOR MODIFIED PROCTOR MOULDS.  COLLAR FOR MODIFIED PROCTOR MOULDS.  COMPACTION RAMMER (ASTM) Army type 4.5 kg, made of corrosion protected steel. Diameter: 50.8 mm. (2”).STRAIGHT EDGE with handle.  STRAIGHT EDGE without handle. Or  **Equivalent** | 01 |  |  |
| 17 | C.B.R. MOTORISED MACHINE  ASTM D1883, D3668, D4429  CBR Motorized Press. It consists of a rigid two column frame, upper beam equipped with ball joint and its height is adjustable by means of a threaded ring nuts. It is operated by means of a constant speed gear motor, with double end, so as to stop the lower plate automatically. Complete with control panel with main switch and up/down reversing.  Max. Capacity: 50 KN.  Power supply: 220-240 V. 50 Hz.  Accessories.  C.B.R. PENETRATION PISTON, made of surface protected steel. Surface:  10 KN. PROVING RING  30 KN. PROVING RING  50 KN. PROVING RING  DIAL GAUGE BRAKE DEVICE, it maintains the max. Ioad reached value on the dial indicator of the load ring with possibility of manual zero setting. Or  **Equivalent** | 01 |  |  |
| 18 | HAND-OPERATED HYDRAULIC EXTRUDER  ASTM D698, D1587, D1883  Used to remove samples from CBR, Proctor and Marshall moulds. Hand-operated driven by means of a hydraulic jack. Made of galvanized steel.  It is supplied complete with Ø 4” and 6” adaptors.  Capacity: 50 KN.  Or  **Equivalent** | 01 |  |  |
| 19 | CBR- MACHINE: 50 KN  ASTM D1883  Maximum vertical clearance 800mm  Horizontal clearance 255mm  Platen diameter 105 mm  Test speed 1.27 mm/min  Power Supply 220V, 50Hz.  Accessories.   1. Soaking Tank. 2. Penetration piston. Surface 1.935 mm2   Proving rings 50kN.  CBR MOULD : ASTM D 1883   * Mould Ø152.4x177.8 mm height   Collar 50.8 mm height, fits both  ends of mould   * Base Plate perforated * ASTM CBR cutting collar * ASTM CBR spacing disc * Filter screen 150 mm diameter, 150 micro meter mesh * 10 lb. annular surcharge weight * 5lb split surcharge weight   Filter papers 150mm dia. Box of 100 Or  **Equivalent** | 01 set |  |  |
| 20 | GLASS WARES AND HARDWARES TOOLS:   * Beaker 500 ml capacity * BEAKER 1000 ML CAPACITY * GRADUATED CYLINDER 1000 ML CAPACITY * GRADUATED CYLINDER 2000 ML CAPACITY * STEEL HAMMER * SPATULA * STAINLESS STEEL BOWLS * STEEL TRAY * VERNIER CALIPER * STOP WATCH * DESICCATOR * CANVAS GLOVES * GLOVES, LATEX RUBBER * PLASTIC BOTTLE, cap. 2 l. * PLASTIC BOTTLE, cap. 5 l. * RUBBER BUCKET, cap. 12 l. * RUBBER BUCKET, cap. 18 l. * CANVAS 2 x 2 m. * FLAT BRUSH * CHISEL * PICK HAMMER * RUBBER HAMMER * FLAT SCOOP * SMALL CURVE SCOOP * MEDIUM CURVE SCOOP * LARGE CURVE SCOOP * SPOON * LADLE * SPADE * TROWEL * BEATER * BRUSH * TRIANGLE SPATULA * DRAWKNIFE   SAMPLE BAGS Or   * **Equivalent** | 01  set |  |  |

**CONCRETE** **TECHNOLOGY**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.NO** | **Name of Items/Specification:** | **Qty.** | **Rate Per Unite** | **Total amount** |
| **1** | **VICAT APPARATUS,** ASTM-C187  (for initial and final setting time of cement )  Hand operated Vicat apparatus, formed of a metal frame. Ø 10 mm sliding plunger weighing 300 gm and a graduated scale. Complete with needle Ø 1.13 mm. for initial setting time, final setting time needle, glass plate Ø 120 mm  **Accessories:**   1. Needle Ø 1 mm for initial setting time. 2. Needle Ø 1.13 mm for final setting time. 3. Glass plate Ø 120mm.   Vicat Mould ASTM. Or   1. **Equivalent** | 02 |  |  |
| **2** | **PLANETARY MIXER, ASTM C 305**  (For cement mortars), composed by bowl and beater made in stainless steel. The control panel is composed by the on-off switch, two positions speed switch and lights.  Bowl capacity: Min 4 lit  **Spare Parts:**   1. STAINLESS STEEL BOWL, capacity. Min 4 lit. 2. STAINLESS STEEL BEATER**.**   Or  **Equivalent** | 01 |  |  |
| **3** | **LE- CHATLIER’S APPARATUS:** BS 4550  (For soundness of cement)  **LE CHATELIER WATER BATH,**  Made of stainless steel and incorporates a 1000 W heater enabling the water to reach boiling point within 25 minutes. Regulation of temperature through hydraulic thermostat from +5 to 100°C. Complete with resistance-tray, cover and thermometer. Allow to realize different tests simultaneously.  Power supply: 220 V. 50 Hz.  **LE CHATELIER MOULD, Ø 30 x 300 mm. Long.**  **LE CHATELIER GLASS PLATES (2),** 50 x 50 mm.  **LE CHATELIER CLIP** to hold the glass plates Or  **Equivalent** | 01 |  |  |
| **4** | **LE CHATELIER FLASK, ASTM C188; BS 4550**  (Relative density of hydraulic cement).  Graduated from Ø to 1 ml. and from 18 to 24cm3  Capacity: 250 ± 0.05 cm3 Or  **Equivalent** | 02 |  |  |
| **5** | **FLEXURAL/COMPRESSION TESTING MACHINE,**  **300 KN. Capacity**, ASTM C 190  With motorized hydraulic power pack fitted with adjustment of the load gradient, rapid approach device and relive valve.  The frame is assembled seamless, with electronic display of load.  Accuracy: ± 1%.  Power supply: 220-240 V. 50 Hz. Or  **Equivalent** | 01 |  |  |
| **7** | **SAND EQUIVALENT APPARATUS ASTM D 2419**  **Set includes :-**   1. Plastic measuring cylinders. 4 nos. 2. Weighted foot assembly 1no. 3. Irrigator tube. 1 no. 4. Rubber tubing (1 m) complete with pinch clip. 1no 5. Syphon assembly, with 5 liter polythene bottle 1no. 6. Funnel 1 no. 7. Carrying case. 1 no. 8. Measuring can, 85 cm3 capacity, and 1 no.   **Accessories:**   1. Calcium chloride. 2.5 kg 2. Form aldehyde. 40 % solution, 2.5 liters 3. Glycerol analar. 2.5 liter 4. Mechanical sand equivalent shaker, ASTM METHOD   220-240V AC, 50Hz, single phase Or  **Equivalent** | 01 |  |  |
| **8** | **ELECTROMAGNETIC SIEVE SHAKER, with Standard sieves set** , **ASTM C 33-13**  Activated by electromagnetic impulses. It is particularly recommended to carry out sieving test where high precision and performance are important. This electromagnetic shaker is of simple and sturdy construction, it is also suitable for wet sieving tests along electronic control panel. The vibrating intensity and the pauses between one vibration and the following one (this is especially indicated for fine material sieving). The sieve shaker can hold up to 10 sieves.  **Standard sieves set** , **ASTM C 33-13**  **(for fine and Coarse aggregates):**  Of Ø 200 mm x 50 mm with hole With compatible electromagnetic sieve shaker. Or  **Equivalent** | 01 |  |  |
| **9** | **CYLINDICAL METAL MEASURES PROVIDED WITH HANDLES , ASTM C29**  ( Forbulk density of aggregate)  **BULK DENSITY 30 dm3,** complete with carrying handles  **BULK DENSITY 15 dm3,** complete with carrying handles  **BULK DENSITY 10 dm3,** complete with carrying handles  **BULK DENSITY 3 dm3,** complete with carrying handles  **BULK DENSITY 1 dm3,** complete with carrying handles  **STEEL ROD,** Ø 16 x 600 mm. Or  **Equivalent** | 01 |  |  |
| **10** | **FLAKINESS GAUGE, BS 812 (complete set).**  To measure the flakiness index of aggregates. Made in galvanized sheet with Set of seven square flakiness sieves made of painted sheet. Or  **Equivalent** | 01 |  |  |
| **11** | **LENGTH GAUGE, BS 812** For measuring the length index of aggregates Or  **Equivalent** | 02 |  |  |
| **12** | **BUOYANCY BALANCE , 6000g x 0.1 g, ASTM C 127**  (For particle density (specific gravity) and water absorption)  The Buoyancy balance system consists of a rigid support frame, incorporating a water tank mounted on a platform.  A mechanical lifting system is used to raise the water tank for immersing the specimen suspended below the balance.  **Accessory:**  **Wire Basket**, with handle for BS 812 relative density, Ø200mmx190mm deep, 1.70mm wire mesh. Or  **Equivalent** | 01 |  |  |
| **13** | **PYKNOMETER, ASTM C 128**  (For the determination of specific gravity ofsands and fine aggregates.)  **SET OF CONE MOULD, FUNNEL AND TAMPER,ASTM C 128**  (To determine the absorption of fine aggregate.) Or  **Equivalent** | 02 |  |  |
| **14** | **SLUMP CONE** **APPARATUS,** ASTM C 143   1. **SLUMP CONE,**  made from galvanized plate,   Suitable for measuringcohesive of concrete.   1. **TAMPING ROD,** made from steel. Dimensions: Ø 16 x 600 mm. 2. **HOPPER,** used for filling the slump cone. Made from aluminum. 3. **BASE PLATE,** made from galvanized sheet iron with handle.Dimensions: 60 x 40 cm.   **GRADUATED RULE** made from stainless steel. Length: 300 mm. Or   1. **Equivalent** | 02 |  |  |
| **15** | **COMPACTING FACTOR APPARATUS.**  **BS 1881 part 103, 5075**  This equipment is used for the determination of the compacting factor of concretes with low, medium, and high workability. The apparatus is made from painted steel sheet, and is composed of two hoppers with trap doors, mounted vertically above a cylindrical mould. Tamping rod 16mm in dia. and 600mm length. Or  **Equivalent** | 01 |  |  |
| **16** | **CONCRETE TEST HAMMER SCHMIDT:**  For the measurement of compressive strength of concrete in ordinary building and bridge construction. Fitted with a built-in automatic recorder device.  Impact energy: 2.207 Nm. (0.225 kg m)  Compressive strength: 10 to 70 N/mm2  **Or** Equivalent Or  **Equivalent** | 01 |  |  |
| **17** | **Determine clay percentage in aggregate.**  **ASTM C 117**   1. This is a gravimetric method for determining the clay, silt, and dust content of that portion of the material finer than 75 μm.  * **BOTTLE ROLLER,** with rotation speed 80 rpm. * **BOTTLE 1 L.,** capacity with lid.  1. **BLUE METHYLENE TEST**   Set for determination of Blue Methylene composed by:   * **ELECTRONIC STIRRER,** with digital display. It is supplied complete with stirring rod, support and fixing nut. Reliable speed between 400-700 rpm. * **BURETTE,** with glass key, 100 ml. capacity. * **FILTER PAPER,** Ø 125 mm. * **GLASS ROD,** length 300 mm. * **BEAKER,** capacity 600 ml. * **BLUE METHYLENE,** (25 gr).   Or Equivalent | 01 |  |  |
| **18** | **CONCRETE MIXER**  Small and lightweight, suitable to obtain small quantities of concrete in situ or in laboratory for practical and easy to transport. Capacity: 100 liters. Or  **Equivalent** | 01 |  |  |
| **19** | **SINGLE CUBE MOULDS** ASTM C 31  For preparation of concrete cube tests.  Made in non-deforming steel, easily disassembled.  Dimensions 10 x 10 x 10 cm.  Dimensions 15 x 15 x 15 cm.  Dimensions 20 x 20 x 20 cm.  Dimensions 30 x 30 x 30 cm.  Dimensions 6” x 6” x 6”. Or  **Equivalent** | 01 |  |  |
| **20** | **BEAM MOULDS** ASTM C 31  For preparation of concrete beam tests, made in non-deforming steel, easily disassembled.  Dimensions 10 x 10 x 40 cm.  Dimensions 10 x 10 x 50 cm.  Dimensions 15 x 15 x 60 cm.  Dimensions 15 x 15 x 75 cm.  Dimensions 20 x 20 x 80 cm.  Dimensions 6” x 6” x 18”.  Dimensions 6” x 6” x 21”.  Dimensions 6” x 6” x 24”.  Dimensions 6” x 6” x 30”.  Dimensions 6” x 6” x 36”.  Dimensions 6” x 6” x 40”. Or  **Equivalent** | 01 |  |  |
| **21** | **HINGED CYLINDER MOULDS, ASTM C31**  Made of steel. Suitable for the preparation of test cylinders.  Dimensions Ø 100 x 200 mm.  Dimensions Ø 150 x 150 mm.  Dimensions Ø 150 x 300 mm.  Dimensions Ø 6” x 12”.  **Accessories:**  **HOPPER** for Ø 150 x 300 mm. cylindrical mould.  **COMPACTIGN ROD.** Long. 50 cm. Or  **Equivalent** | 01 |  |  |
| **22** | **CONCRETE SPECIMENS CURING TANK, ASTM C 31**  Made from galvanized metal, designed for curing of concrete specimens cubic as well as cylindrical. It is supplied complete with grid, under which there is heating resistance, waste gate and complete overflow pipe. Or  **Equivalent** | 01 |  |  |
| **23** | **COMPACT COMPRESSION TESTING MACHINE,**  **3000 KN. Capacity, ASTM C 39**  Motorized, suitable for testing 150 x 300 and 160 x 320 mm; cylinders and also for testing 150 mm. cubes, prismatic and Brasilian tests. Reading effected by means of a digital display.  **Accessories for Compression for Machines:**  **REDUCTION PLATEN,** made of steel. Thickness: 50 mm.  **REDUCTION PLATEN,** made of steel. Thickness: 75 mm.   * **SAFETY GUARD.** * **COMPRESSOMETER,**   For the determination of static elasticity modulus. Used for the measurement of stress and strain on Ø 150 x 300 mm. cylinders during compression test.   * **COMPRESSOMETER,**   For the determination of static elasticity modulus. Used for the measurement of stress and strain on Ø 150 x 300 and 160 x 320 mm. cylinders during compression tests. Complete with three aluminum rings, 2 centesimal dial gauges and carrying case.   * **COMPRESSOMETER,**   For the determination of static elasticity modulus. Used for the measurement of stress and strain on cubes with side 150 mm. during compression test.   * **FLEXURAL TEST SET,**   Used with 150 x 150 x 600 mm. beams. Complete with steel flexural bearers.   * **SPLITTING TENSILE TEST SET (Brazilian test),**   Suitable for Ø 150 x 300 and 160 x 320 mm. specimens. It is composed of a lower bearing plate with self-centering system and of an upper articulation with compression platen.   * **FLEXURAL TEST SET,**   For test on ceramic floor tiles, terrazzo, tiles, pieces of clays and bricks.  Or Equivalent | 01 |  |  |
| **24** | **TRIPLE BEAM MECHANICAL BALANCE**  Complete with stainless steel pan, calibration device, magnetic damper and weight set.  20 kg with accuracy of 1 gm Or  **Equivalent** | 01 |  |  |

**Hydraulics and Irrigation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.no** | **Name of Items/Specification** | **Qty** | **Rate per Unit** | **Total Amount** |
| **1** | HYDRAULIC BENCH   * Mobile and floor standing service unit   for fluid mechanics apparatus with a working height  of 1 meter above the floor level.   * Base constructed from robust, corrosion resistant   plastic molding.   * Top constructed from glass reinforced plastic * Volumetric flow measurement via remote sight gauge * Stepped tank for low and high flow rates * Open channel in bench top with quick release   outlet fitting   * Self-priming centrifugal pump with maximum head 21   m water with a maximum flow of 1.35 liter per second   * Motor rating = 0.37 Kw   Sump tank capacity = 250 liters Or   * **Equivalent** | 01 |  |  |
| **2** | (**STABILITY OF A FLOATING BODY**).  Water tank moulded plastic nominally 600x 400x 120mm  total weight of floating assembly nominally (3.2kg)  working height of mast nominally 240mm Floating  pantoon 360x203x76mm Two magnetized trim  weights= 35g.Angular tilt of pantoon 8 degree  each side Adjustable sail weight 525g. Or  **Equivalent** | 02 |  |  |
| **3** | **ORIFICES, NOTCHES (Rectangular and triangular).** | 01 |  |  |
| **4** | **PITOT-STATIC TUBE APPARATUS.** | 01 |  |  |
| **5** | **VENTURIMETER**  Venturitube aluminum inlet inside diameter 26mm. Throat inside  diameter 16mm outlet inside diameter is 26mm manometer tubes transparent plastic range: 0-290mm max: flow rate 26 lit nominally 27 L/min. Or  **Equivalent** | 01 |  |  |
| **6** | **CURRENT METER.**  Cup type with current meter using cable with sinking weight or wading rod and measures stream flow velocities from 0.3 to 3.5 m/ s with cups. Calibration charts. Or  **Equivalent** | 01 |  |  |

**Computer Trade**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.No** | **Description (Details given in PC-1)** | Qty | Rate per Unit (In Rs.) | Total Cost |
| 1 | Server (Branded) Processor: Core i7 8th Generation or Higher  CPU: 1 at least  Intel Chipset  Cache: 04 MB or Higher  RAM:4GB 1600 MHZ DDR3 or higher and Upgradeable  Hard Drive  500 GB or Higher  Super DVD/RW  Integrated Intel ( R) Graphics  Media Accelerator HD.  Integrated High Definition  Audio,  Integrated Gigabit Ethernet  LAN 10/100/1000,  Built-in Wifi (Optional)  USB Key Board, Mouse USB ,  Monitor:  LCD / LED Full HD  19” or Higher  Casing:  Tower or Mini-Tower  Warranty:  (by Manufacturer): 03 Years  (Parts &Labor):  on-site, per failure  **Or Higher** | 01 |  |  |
|  | Branded 8th Generation Core i7-8400 PCs or higher  Processor: Intel 8th Generation Core i7-8400 8th Generation Intel Core i5-8400 processor (9 MB Cache, up to 4.0 GHz)  Chipset: Intel B360 Chipset  Memory: 8 GB DDR4 2400 MHz (8Gx1)  Internal Storage: 1-TB SATA 7200RPM Hard Drive  Optical Drive: DVD-RW Super Drive  USB Ports: Two USB 3.1 Gen 1Ports; Four USB 2.0 Port,  Security Features: Kensington Lock Slot, Padlock ring  Audioi: ,Audio Headset Port, Microphone Port, Audio Line-in Port, Audio Line-out Port,  Video: Integrated UHD 610 Shared Graphics, HDMI 1.4 (UMA), VGA Port,  Communication: Realtek RTL8111H Gigabit Ethernet controller 10/100/1000 Mb/s Ethernet (RJ-45 )  Wireless LAN: DW 1707 + BT4.0 (802.11bgn + Bluetooth 4.0, 1x1) via M.2  Chassis: Micro Tower chassis  Digital Media Card: SD Card Slot  Keyboard: USB Soft Keyboard  Mouse: USB Optical Mouse  Display: 18.5-inch Wide Screen LED  Warranty: 3-years Parts & 1-year onsite Technical Support  **Or Higher** | 30 |  |  |
|  | MULTIFUNCTIONAL PRINTERS  Functions: PRINT/SCANNER/COPY/FAX  PRINTER TECHNOLOGY: Laser  CONNECTIVITY, STANDARD: 1 Hi-Speed USB 2.0, Fast Ethernet 10/100Base-TX  MOBILE PRINTING CAPABILITY: Yes  WIRELESS: Yes  DISPLAY: 3.0-in (7.62-cm) touch screen CGD  PRINT SPEED BLACK: Up to 22 PPM  PRINT QUALITY: Up to 600 x 600 dpi (with HP Fast Res 1200)  **Or Higher** | 1 |  |  |
|  | MULTIMEDIA PROJECTORS  Brightness: 3200 Lumen XGA  Display System: 3 LCD system  Size of effective display area: 0.63"(16mm) x 3, Aspect ratio: 4:3  Number of pixels: 2,359,296 (1024x768 x 3) pixels  Zoom: Optical: Manual (Approx. x 1.3)  Focus: Manual  Throw ratio: 1.37:1 to 1.80:1  Light source: Ultra high pressure mercury lamp 215 W type  Lamp mode: High / Standard / Low: 3000 H / 5000 H / 10000 H  Filter cleaning cycle\*1Max. 1000 Hours  Display Screen size: 30” to 300” (0.76 m to 7.62 m)  Lamp mode: High / Standard / Low: 3200 lm / 2300 lm / 2000 lm  Contrast ratio (full white / full black)\*3: 4000:1  Computer signal input: Maximum display resolution: UXGA 1600 x 1200 dots\*4  Projector Screen: 8’ x 10’ Wall Mount with Ceiling Mount Kit complete with installation & Wiring  **Or Higher** | 1 |  |  |
|  | Air Condition 2Tons DC inverter 24000BTU | 1 |  |  |
|  | Networking of Computer Lan with:  Layer 2 Non Manageable Switch: Non-Manageable layer 2 Full Duplex,10/100 BaseT, TX Fast Ethernet 24 Ports with 2 ports Gigabit for Uplink  Non-Manageable Switch: Non-Manageable, 10/100 BaseT, TX Fast Ethernet 08 Ports  Wireless Access Point/Router: 300 Mbps with Minimum 4 Ethernet Ports(10/100/1000 Mbps) Or higher  Passive Equipments like:  UTP Cable CAT6E: UTP Cable 4 pair, Fast Ethernet Supportive,  PoE Enabled Roll/Box = 1000 ft minimum  Face Plates: Face plates with dual shutter, dual fast Ethernet Supportive UTP  Back Box: Standard  Patch Panel: UTP 24-Port Patch Panel with rear Cable Management  Data Cabinets: Data Cabinet 4 U, Perforated Top, Floor Standing/wall mounted with minimum 2 Exhaust Fans and power panel, glass door and Lock.  Ducts: 16×38 (10 ft per length) and 40×40 (10 ft per length) ISO Certified  PVC Pipe: PVC Flexible and UTP Cable laying & Termination job (Per running foot) and as per requirement of Laboratory.  **Or Higher** | 1 |  |  |
|  | Computer Laboratory tools Box:  Crimping Tool, Wire Stripers, Cable Cutters, CAT6 Clips 500 Pack, Keystone CAT6 Jacks(500) (Pack),Cable Testers, Screw Drivers Set. Relevant Software Sets. | 1 |  |  |
|  | UPS for instructor’s workstation desk & Multimedia 3KVA | 1 |  |  |
|  | Photocopier Machine  45 cpm, Ram 2 GB or higher  250 to 320 HDD  Building duplex, built-in RADF/DADF  Paper capacity 1100 SHEETS  Drum life 350000 to 500000 copies or above single drum  Single component, original Size A3  Toner life 35000 to 42000 copies A4  **Or Higher** | 01 |  |  |

|  |  |  |
| --- | --- | --- |
| **Glassware** | | |
| **S#** | **Items** | **Quantity Required** | **Cost per item** | | **Total Cost** |
| 1 | Beaker 50 ml (Pyrax) | 24 No |  | |  |
| 2 | Beaker 250 Ml (Pyrax) | 24 No |  | |  |
| 3 | Beaker 500 ml (pyrax) | 24 No |  | |  |
| 4 | Beaker 1000 ml (Pyrax) | 12 No |  | |  |
| 5 | Wash bottle (plastic) | 24 No |  | |  |
| 6 | Bottle reagent 500ml (narrow mouth) | 16 Doz |  | |  |
| 7 | Bottle reagent 250 ml (narrow mouth) | 24 doz |  | |  |
| 8 | Bottle Reagent 500 ml (wide mouth) | 6 doz |  | |  |
| 9 | Bottle Reagent 3 ltr | 24 No |  | |  |
| 10 | Burette 50 ml | 24 No |  | |  |
| 11 | Measuring cylinder 100 ml | 6 No |  | |  |
| 12 | Measuring cylinder 10 ml | 12No |  | |  |
| 13 | Crucible Porcelain with lid | 24 No |  | |  |
| 14 | Cork rubber assorted | 6 doz |  | |  |
| 15 | Fusion tube | 24 gross |  | |  |
| 16 | Capillary tube | 10 lb |  | |  |
| 17 | Centered Glass Crucible lid | 24 No |  | |  |
| 18 | Borosilcate Glass | 24 No |  | |  |
| 19 | Dish evaporating (Porcelain 75 | 15 No |  | |  |
| 20 | Flask Round bottom 500 ml | 24 No |  | |  |
| 21 | Flask Flat Bottom 3 ltr, | 10 No |  | |  |
| 22 | Flask Conical 100 ml | 24 No |  | |  |
| 23 | Flask Filtration 500 ml | 24 No |  | |  |
| 24 | Funnel Buckner | 24 No |  | |  |
| 25 | Funnel separating 250 ml | 24 No |  | |  |
| 26 | Funnel | 24 No |  | |  |
| 27 | Filter paper | 6 Pkt |  | |  |
| 28 | Glass rods | 24 No |  | |  |
| 29 | Kips ”s apparatus 1000 ml Litmus paper | 10No |  | |  |
| 30 | Litmus paper blue and Red | 24 pkt |  | |  |
| 31 | Pipette 10 ml | 24 No |  | |  |
| 32 | Pestle & Mortar glass | 10 No |  | |  |
| 33 | Tiles Glazed white | 24 No |  | |  |
| 34 | Test tube hand | 4 gross |  | |  |
| 35 | Trough Glass | 24 No |  | |  |
| 36 | Burette. | 24 No |  | |  |
| 37 | Suction pump glass | 24 No |  | |  |
| 38 | Watch glass | 24 No |  | |  |
| 39 | Ostwald Viscometer | 24 No |  | |  |
| 40 | Stalagmometer | 24 No |  | |  |

|  |  |  |
| --- | --- | --- |
| **Chemical** | |  |
| **S#** | **Items** | | | **Quantity Required** | **Cost per item** | **Total Amount** |
|  | Nitric Acid | | | 5 ltr |  |  |
|  | Hydrochloric Acid | | | 5 ltr |  |  |
|  | Sodium Hydroxide (Pellets) | | | 2 kg |  |  |
|  | Ammonia liquor | | | 5 ltr |  |  |
|  | Carbon Disulphide | | | 2 kg |  |  |
|  | Silver Nitrate | | | 250 gm |  |  |
|  | Ammonium carbonate | | | 1 kg |  |  |
|  | Sodium Carbonate | | | 1 kg |  |  |
|  | Sodium Nitrate | | | 1 kg |  |  |
|  | Sodium bicarbonate | | | 1 kg |  |  |
|  | Potassium carbonate | | | 1 kg |  |  |
|  | Potassium chloride | | | 1 kg |  |  |
|  | Potassium chromate | | | 1 kg |  |  |
|  | Potassium Dichromate | | | 1 kg |  |  |
|  | Potassium chlorate | | | 1 kg |  |  |
|  | Ammonium sulfide | | | 1 kg |  |  |
|  | Ammonium sulfate | | | 1 kg |  |  |
|  | Ammonium Molybedate | | | 1 kg |  |  |
|  | Bismith Nitrate | | | 1 kg |  |  |
|  | Bismith Chloride | | | 1 kg |  |  |
|  | Cadmium Nitrate | | | 1 kg |  |  |
|  | Cadmium chloride | | | 1 kg |  |  |
|  | Lead Nitrate | | | 1 kg |  |  |
|  | Lead Carbonate | | | 1 kg |  |  |
|  | Lead Acetate | | | 1 kg |  |  |
|  | Sodium Nitropurside | | | 1 kg |  |  |
|  | Sodium sulfite | | | 1 kg |  |  |
|  | Sodium sulfate | | | 1 kg |  |  |
|  | Sodium Thiosulfate | | | 1 kg |  |  |
|  | Sodium Chloride | | | 1 kg |  |  |
|  | Sodium chromate | | | 1 kg |  |  |
|  | Acetic acid (glacial) | | | 2.5 ltr |  |  |
|  | Oxalic Acid | | | 1 kg |  |  |
|  | Maleic Acid | | | 1 kg |  |  |
|  | Succinic Acid | | | 1 kg |  |  |
|  | Salicylic acid | | | 2.5 ltr |  |  |
|  | Ethylene glycol | | | 1 kg |  |  |
|  | Potassium poarmansanate | | | 1 kg |  |  |
|  | Glycerine | | | 1 kg |  |  |
|  | Acetone | | | 2. ltr 5 |  |  |
|  | Chloroform | | | 2.5 ltr |  |  |
|  | Carbon Terachloride | | | 2.5 ltr |  |  |
|  | Banzene | | | 2.5 ltr |  |  |
|  | Toluene | | | 2.5 ltr |  |  |
|  | Xylene | | | 2.5 ltr |  |  |
|  | Benzaldehyde | | | 1ltr |  |  |
|  | Cyclohexane | | | 2.5 ltr |  |  |
|  | Bleaching powder | | | 1 kg |  |  |
|  | Butyl acetate | | | 2.5 ltr |  |  |
|  | Methyl ethyl ketrone | | | 2.5 ltr |  |  |
|  | Copper sulfate | | | 1 kg |  |  |
|  | Copper Chloride | | | 1 kg |  |  |
|  | Zinc Chloride | | | 1 kg |  |  |
|  | Zinc Sulfate | | | 1 kg |  |  |
|  | Zinc Carbonate | | | 1 kg |  |  |
|  | Zinc Granules | | | 1 |  |  |
|  | Urea | | | 1 kg |  |  |
|  | Magnesium sulfate | | | 1 kg |  |  |
|  | Magnesium Chloride | | | 1 kg |  |  |
|  | Magnesium Nitrate | | | 1 kg |  |  |
|  | Magnesium Dixide | | | 1 kg |  |  |
|  | Magnesium sulfate | | | 1 kg |  |  |
|  | Cobalt chloride | | | 1 kg |  |  |
|  | Cobalt Nitrate | | | 1 kg |  |  |
|  | Cobalt carbonate | | | 1 kg |  |  |
|  | Nickel sulfate | | | 1 kg |  |  |
|  | Nickel nitrate | | | 1 kg |  |  |
|  | Stannous chloride | | | 1 kg |  |  |
|  | Stannic chloride | | | 1 kg |  |  |
|  | Phenolphthalein | | | 0.5 kg |  |  |
|  | Methyl orange | | | 1 pack |  |  |
|  | Methyl red | | | 1 pack |  |  |
|  | Congo red | | | 1pack |  |  |
|  | Aluminum Nitrate | | | 1 kg |  |  |
|  | Aluminum sulfate | | | 1 kg |  |  |
|  | Ethyl alcohol absolute | | | 2.5 ltr |  |  |
|  | Methyl alcohol | | | 2.5ltr |  |  |
|  | Sodium Benzonate | | | 1 kg |  |  |
|  | Sodium phosphate | | | 1 kg |  |  |
|  | Sodium tripolyphosphete | | | 1 kg |  |  |
|  | Sodium silicate | | | 1 kg |  |  |
|  | Zinc Oxide | | | 1 kg |  |  |
|  | Boric Acid | | | 0.5 kg |  |  |
|  | Sodium Tetra Borate (Borax) | | | 0.5 kg |  |  |
|  | Stearic Acid | | | 0.5 kg |  |  |
|  | Iodine crystals | | | 0.5 kg |  |  |
|  | Potassium Iodate | | | 0.5 kg |  |  |
|  | Starch | | | 0.5 kg |  |  |
|  | Buffer solution pH-7 | | | 1 ltr |  |  |
|  | Buffer solution pH-4 | | | 1ltr |  |  |
|  | Buffer solution pH-9/-10 | | | 1ltr |  |  |
| 95 | Citric acid | | | 0.5 kg |  |  |

**Chemistry equipment**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.No** | **Name of items Revised Specification** | **Qty** | **Unite Price** | **Total amount** |
| 01 | **PH Meter Portable:**   * PH Range: -2.00~16.00pH: * PH Accuracy: ±0.01pH * MV Range: -1999~1999mV * MV Accuracy: ±1mV * Calibration Points: 2 points * Calibration Solutions: USA (pH4.01, 7.00, 10.01) * Temperature Range: 0~100°C, 32~212°F * Temperature Accuracy: ±1°C * Temperature Calibration: Manual * Temperature Compensation: 0~100°C, 32~212°F * Automatic or Manual * Hold Function : Manual * Memory: 50 data sets with Date/Time stamping * Output: USB Communication Interface * Connector : BNC * Built in battery Luxury III arm stand;   PH Electrode, Temp Probe. Or   * **Equivalent** | 03 |  |  |
| 02 | **Conductivity Meter**   * Conductivity Range: 0~20mS/cm (Max.200mS/cm) * Conductivity Accuracy: ±0.5% Full Scale * Calibration Points: Up to 5 points * Calibration Solutions: 10uS/cm, 84uS/cm, 1413uS/cm, * 12.88mS/cm, 111.8mS/cm * TDS Range: 0~10ppt (Max. 20ppt, Depending on factor setting) * TDS Accuracy: ±1% Full Scale * TDS Factor: 0.1~1.0 (Default 0.5) * Temperature Range: 0~105°C, 32~221°F * Temperature Accuracy: ±0.5°C, ±0.9°F * Temperature Calibration: Manual * Temperature Compensation: 0~100°C, 32~212°F, Automatic or Manual * Temperature Coefficient: 0.0~10.0% per °C * Compensation Modes: Linear or Pure Water * Cell Constant:: K=0.1, 1, 10, Selectable * Normalization Temperature: 20°C or 25°C * Auto-Off: Manual or Automatic (10, 20, 30 minutes after last key pressed, Selectable) * Reset Function: Yes * Sensor Type: Platinum (Order Code: CON-0.1, CON-1 or CON-10 * Memory: 500 data sets with Date/Time stamping   Battery operated Stand Or   * **Equivalent** | 03 |  |  |
| 03 | **Balance Digital**  Capacity: 2000gm  Sensitivity: 0.1gm  For: 220-240V, 50/60Hz, single phase supplies( Range: 3200gm-3500gm) Or  **Equivalent** | 03 |  |  |
|  | **Oven(Lab Oven)**  Temperature range: 250 – 300 ºC  With natural convection Air, microprocessor PID controller, separately adjustable over-temperature controller, and perforated stainless steel Inner side. For 230V 50/60Hz single phase supplies Or  **Equivalent**. | 03 |  |  |
|  | **Water Bath**  Capacity: 50-60 lit  Hole: 4 or 6  Stainless steel Inner side, with integral heating element, connector with cable, constant level and set of concentric rings. For 220VAC single phase supplies; rating 1kW. Or  **Equivalent** | 03 |  |  |
|  | **Magnetic Stirrer with Hot Plate.**  It’s heating temperature from room temperature to 300 degrees Celsius. Magnetic stirrer built-in the CPU chip, it can control each operation functions of stirrers. The stirrer uses push-button to increase or decrease the stir speeds,  Stirring Volume: 0 to 2000mL Stirring Speed: 0 to 1250rpm Panel Material: Stainless Steel Temperature: ambient to 300 ºC  Timer: 0 to 999 minutes Power Requirements: 220V/50Hz, with internal thermocouple, slimy bar Or  **Equivalent** | 03 |  |  |
| 09 | **Muffle Furnace**  Temperature: ambient to 1150 ºC  Programmable 0 ºC to maro in two steps. Suitable for element analysis and quenching, tempering and annealing of small steel parts as well ad-sintering, melting and analyzing of metal and ceramics. Used in laboratories of mines, enterprises and scientific research institutes.  220v/50Hz Max Temp: 1300℃ Or  **Equivalent** | 01 |  |  |
| 10 | **Centrifuge Machine**  Max. speed: 4000rpm  Capacity: 12×20ml  Max.RCF: 2325\*g  Power source: 220V 50Hz  Time range: 0~ 60min, constant? Pulse? Or  **Equivalent** | 03 |  |  |
| 11 | **Spectrophotometers**  Product/Specification: - Wavelength Range 325-1000nm   * Spectral Bandwidth 4nm Optical System Single Beam , * Grating 1200 lines/mm Wavelength * Accuracy ±2nm * Wavelength Repeatability 1nm Wavelength * Setting Manual * Photometric Accuracy ±0.5%T * Photometric Range 0-200%T , -0.3 - 3A Stray Light 0.3%T * Stability ±0.004A/h @500nm * Display 128\*64 Dots LCD * Detector Silicon Photodiode * Power Requirement AC 220/50Hz.   Water distillation **??** Or   * **Equivalent** | 02 |  |  |

**Physics**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.No.** | **Description of Items with Specification** | **Qty.** | **Unite Rate** | **Total amount** |
|  | **Resonance tube apparatus, length 1 meter:**  With Plastic tube 840×25mm mounted on record with 500ml Plastic tube bulb. | 10 Nos |  |  |
|  | **Sonometer with slotted weights and two wedges:**  Wooden resonance box with two rules 1m long. one each brassand steel wires.two moveable bridges pulley and fixed screws, slotted weights ½ kg×4,1 kg×4 ,2 kg×4 | 10 Nos |  |  |
|  | **Linear Expansion apparatus with metal rod and Accessories:**  Apparatus added with speedometer, glass jacket  enclose Brass, Iron, Aluminum and a Copper rod within  Error scale having differently colored pointers.  Accessories: Brass, Iron, Aluminum ,Copper rods | 10 each sets |  |  |
|  | **Steam generator:**  Aluminum vessel with cork lid and retainer on an adjustable hot  plate with thermal circuit breaker, volume 250ml | 12 No |  |  |
|  | **Sextant:**  Student model,  Comprising 220mm radius,  withsighter adjustable half mirror and scale 0 to 130 with Vernier reading to five minimum in wooden case**.** | 10 Nos |  |  |
|  | **Set of weights:**  13 pieces set of Brass weights in storage block.  1×1g,2×2g,1×5g,1×10g.2×20g,1×50g,1×100g,2×200g,1×500g  ,1×1000g**.** | 10 Nos |  |  |
|  | **Kundt’s tube with scale and Accessories:**  Transparent acrylic tube with scale and end plates with tubing  nozzles for filling with various gases,built-in speaker at one end,  a bore and guide for accommodating moving piston or probe  microphone at the other end. Includes retaining clips for mounting  on stands and a connector lead for the speaker,length 1000mm,dia 70mm,tube nozzle 7mm dia.  Accessories for each set:  1Probe micro phone with frequency range 20hz-20000hz with  DIN plug for battery box,barrel foot, 1function generator  (230V,50hz),1 whistle,a 1700hz tuning fork,1 bottle of corkpowder. | 10 Nos |  |  |
|  | **Hook’s law apparatus with helical spring:**  Pointer and scale graduated in cm and mm hanging  weights 6×50gm, 5 helical springs of lengths 120mm, 145mm,  150mm. 147mm,142mm**.** | 10 Nos |  |  |
|  | **Convex lenses:**  Of different focal lengths from 10cm to 50 cm | 60 No |  |  |
|  | **Concave lenses:**  Of different focal lengths from 10cm to 50cm | 60 No |  |  |
|  | **Concave mirrors:**  Of different focal lengths from 10cm to 50cm | 60 No |  |  |
|  | **Convex mirrors:**  Of different focal lengths from 10cm to 50cm | 60 No |  |  |
|  | **Fletcher trolley complete:**  Light metal track 1720×150 min wide with leveling feetcovered with stops at either end, aluminum pulley 50mm  dia., clamp for vibrator and automatic Pen release. Metal trolley with three wheels mounted.on ball bearings. Five hooks to accommodate cylindrical masses approximate 350gm. Vibrator 60mm long with clamping works at 5 and 8Hz and Pen holder to take fibertip type of pen. | 03 No |  |  |
|  | **Single ray projector with accessories:**  Light source for experiments on optics, connecting line 1.5m long with 4mm plug dimension 120mm×70mm dia., magnetic holder for single ray projector 12V, 60VA (230V, 50Hz), Halogen lamp12V, 35W | 02 sets |  |  |
|  | **Multiple ray projectors, magnetic with accessories:**  Light source for optics. Lamp 12V, 55W connecting line 1.5 meter long with 4mm Plug. Dimension 150 × 200 × 50mm3 Transformer 12V, 60 VA9230,50Hz) Halogen Lamp 12V, 55W. | 02 sets |  |  |
|  | **Optics kit for white board:**  Plan mirror (plastic) 200×35×35mm3. Convex, concave mirror f=±100mm 200×35×35mm3.  Plano Concave lens (Acrylic glass), f= 400mm, 200×40×35mm3.  Plan parallel Plate (Acrylic glass) 200×100×35mm3.  Semicircular body, f=200mm dia. 200×35mm2 (Acrylic glass)  Right angled prism 200×200×35mm2 (acrylic glass)  Cubide ( Plastic) 100×20× 35mm3  Cylinder (plastic), dia. 5×35mm2  Cylinder(plastic) dia. 6×35mm2 | 10 Nos |  |  |
|  | **Heat equivalent apparatus:**  Consist of a shaft with ball bearing at both ends, an integrated counter for measuring the number of revolutions and an attached table clamp. 1 basic unit, 1 Aluminum calorimeter, 1 temperature sensor, 1 pair of adopter cables with 4mm safety plugs / 2mm plugs, 1 fraction belt, 1 bucket of 5 liter, 1 counter weight, cord of length 1.80m and temperature calibration table. | 10 Nos |  |  |
|  | **Optical bench complete with all standard accessories:**  **Optical bench:**  Optics Track (1.2 m) rugged aluminum track. The metric tape makes position measurements easy.  **Accessories:**  Light Source has a lighted crossed arrow target with metric scale for focusing images through lenses or using with the concave mirror. Acts as a point light source, 1, 3, or 5parallel rays, or red-green-blue rays.  Lenses:4 - 50 mm diameter. Lens’s focal lengths +100, +200, +250, -150 mm mounted in protective holders. Concave/Convex Mirror: 50 mm diameter plastic mirror with reflective surface on both sides.  Includes "half-screen" upon which the image is focused.  Adjustable Lens Holder: from 19 mm to 75 mm in diameter**.**  Storage Box:Everything fits neatly into the protective storage box, with the exception of the 1.2 meter Optics Track.  1 transparent screen, 1 white screen.  1 pin hole aperture d=1mm  1 pin hole aperture d=6mm | 10No |  |  |
|  | **Electrical calorimeter (1200ml) with accessories:**  Consist of a double walled, heat insulating plastic container with insulating vessel inside made of reflecting glass with heating coil and stirrer  **Accessories:**  Aluminum shot 100g, copper shot 200g, glass shot 100g, granules for filling calorimeter. | 10 each set |  |  |
|  | **Precision hair Hygrometer:**  Consist of a round plastic housing with a human hair  Measuring range:0%----100% relative humidity  Temperature range: 35c-+65% 0C  Reading accuracy: ±5%  Diameter: 100mm | 10 Nos |  |  |
|  | **Torsion apparatus:**  Searle horizontal pattern. Two cast iron feet and grub securing screws separated by two support rods approx. 700mm long, wheel 165mm dia. moving in ball bearings, mounted on front foot, other end supported with clamping block through rear foot with two aluminum scales graduated with 30-0-30 in single degree mounted on pillar support, two pointers with clamp for attaching to specimen, one each Brass and Steel rods 5mm diameter, chord and hook for carrying massesand two spanners for clampingblock nuts. | 10 Nos |  |  |
|  | **Differential pulley:**  One piece aluminum with diameter of 38.5 mm & 63.5mm mounted in a metal frame with hook**.** | 06 No |  |  |
|  | **Differential wheel and axle;**  compound wheel and axel with cast aluminum alloy block  Comprising wheel 100mm diameter and axel 50mm & 25mm diameter mounted on adjustable steel cones and steel frame, wood back board with four holes for wall mounting, complete 5m nylon cord and steel hook. | 06 No |  |  |
|  | **Maxwell’s needle with accessories:**  Hollow metal cylinder 200mm long pointer and chuck to accommodate wires up to 20swg with each hollow and solid cylinders 50mm long tripod, stand with rod 1.2m long, base with leveling screws, clamp with arms 180mm long with chuck complete with three wires 1.5m long.one Brass26swg and one each steel 26 and 20swg. | 10 Nos |  |  |
|  | **Friction measuring apparatus with Accessories:**  Demonstration apparatus with moveable friction surface for measuring static and dynamic friction. The track can be made inclined. Dynamometer, 3 rails for holding static bodies, three 100gm weight.  **Accessories:**  Precision dynamometer (1N range),(2N range),(10N range) | 03 No. |  |  |
|  | **Experiment set pulleys, block and tackle:**  Complete set of equipment consisting of a stable base plate, retort stand rods, pulley blocks, block and tackle, a set of pulleys of various diameters on an axle, weight holders, slotted weights with base plate 810×200mm ,pulleys 50mm diameter, standrods810mm×12.5mm,slottedweights2×10g,2×20g,2×50,4×100g,4×200g,1×500g,holders,1×10g,1×20g,5×50g**.** | 03 Nos |  |  |
|  | **Reciprocating motion motor:**  A field coil motor connected to a rotatory to linear convertermechanism showing cross sectional view. Both motor and gearbox are fully sectioned to show the method of operation. Lead from motor and gear box together taken to three 4mm sockets for connection to a 12 volts DC or AC supply mounted on plastic base complete with instructional booklet**.** | 03 Nos |  |  |
|  | **Compound lever (Brace version):**  Wooden structure consisting of Front and rear legs, leaver arm, base beam, handle, arms, lever arm, beam sides, brace, feet, hex bolt, washer, fasteners. | 03 Nos |  |  |
|  | **Forces in a Jib crane apparatus with complete accessories:**  Bench mounted.The unit consists of a metallic rod which provides the support locations for jib and tie. Load is applied via a hanger on the junction of jib and tie. To measure the deformation in jib and tie, dial gauges are connected to both elements. | 06 Nos |  |  |
|  | **Simple screw jack for demonstration to students:**  220 mm diameter turntable fitted with a 30 mm x 6 mm pitch screw is supported in a heavy cast iron base. Stand on a firm bench and a cord and weight hanger are wound round the rim of the turntable and hung over the pulley. The pulley runs on ball bearings to reduce friction to a minimum. To be provided with instructional manual | 04 No |  |  |
|  | **Inclined plane:**  Metal base and inclined surface plane hinged with scales  for angles, length and height. angle of inclination  between 0-45,adjustable pulley, roller weight pan and cord | 03 No |  |  |
|  | **Simple harmonic module/apparatus:**  Consist of a black metal disc, 200mm dia supported vertically on a clear plastic base fitted with feet. A white marker 13mmdia may be made to follow a circular orbit about the central of the disc. A similar marker move in a slot along the  diameter of the disc in phase with the peripheral marker performing SHM when the peripheral marker caused to rotate  at uniform speed .The disc is marked with cords and radial lines to assist in locating the relative marker positions. | 10 Nos |  |  |
|  | **Worm and wheel apparatus:**  Wall-mounted, to study a way of connecting 2 shafts at right angles. Gear sets for 1, 2, 3 and 4 start worm and wheel units; interchangeable to fit on a rigid steel back plate. Two load hangers and weights set. | 03 sets |  |  |
|  | **Derrick Crane:**  Bench-top, for analysis of internal forces in a pin-jointed framework. Deflection measured by individually calibrated leaf-spring balances. Movement measured by digital Vernier. Load hanger, loading weights, link and digital caliper. | 03sets |  |  |
|  | **Gearing elements to illustrate simple mechanical belt and**  **gear wheel drives**:  Gearing elements consisting of base plate, belt pulley(35mm diameter), belt pulley (70mm dia.) gear wheel (20 teeth), gear wheel (40 teeth), crank handle, drive belt sets. | 03 sets |  |  |
|  | **Reaction of beam apparatus:**  .Bench mounted. This apparatus is designed for simple experiments and demonstrations on simply supported beams. Two spring balances act as supports and enable reactions to be read directly. Three movable load hangers allow loads to be put in a number of positions.Levers can be investigated by suspending the beam from the free standing frame, and holding down the end with a spring balance. | 03No |  |  |
|  | Bell crank lever:-   * + - 1. Strong table unit for demonstrating the application of moment to a crank lever.       2. Pressure gauge 50N.       3. Metal crank mounted in ball bearings.       4. Mechanical advantage min. 1:1 max. 2:1       5. Fine compensation device for adjusting the crank so that the forces always act vertically.       6. Crank length vertical: 200mm, horizontal: 400mm.   Set of weights: up to 20N along with 6 weights with carrier. | 04No |  |  |
|  | **Fractional horse power motor and Accessories:**  max 746 watts(single phase induction)with prony brake and revolution counter. With related accessories required for operational characteristics. | 10 Nos |  |  |
|  | **Fly wheel with slotted weight:**  Cast metal made, approx. 200mm dia×40mm thick mounted on a balanced horizontal shaft in metal bracket 280×180mm2 drilled forwall mounting. | 03 No |  |  |
|  | **Specific gravity bottle,25cc:** | 24 No |  |  |
|  | **Specific gravity bottle,50cc:** | 24 No |  |  |
|  | **Viscometer (Standard Size)with Accessories:**  Falling sphere viscometer with 6 spheres and 1 ball gauge measuring range 0.5mPaS To 7×104mPaS.  **Accessories:**  2 sphere of Borosilicate glass,2 spheres of Ni-iron and 2 spheres of steel, thermometer 0-100C,test certificate with accurate values for spheres constant K and density ,silicon tubing(2x) immersion/circulation thermostat | 10 Nos |  |  |
|  | **Photo Electric cell for determining planks constant with Accessories:**  Basic apparatus with photo cell, volt meter, Nano ammeter and power supply, 5 LEDs in casing with connector leads one plug in supply 12V AC, wave length 472 nm, 505 nm, 525nm, 588 nm, 611nm,  **Accessoriesfor photo electric cell:**  Set of 15 experimental leads,75cm | 10 Nos |  |  |
|  | **Galvanometer DC:**  Range ± 35 Micro Amp, scale division 1 Micro Amp, Internal resistance 1000 ohm | 10 Nos |  |  |
|  | **Laser beam apparatus :**   * 0.5mw He-Ne Laser * optical bench * screen   Metal bench ,guide rail with leveling plate form 500mm,laser diode driver and temperature controller, laser safety goggles.1000mw and 100mw diode laser with built in cooler, thermistor and photo diode, lens, collimator, optical rider, mounting plate, Nd:YaG crystal. Laser mirror 1 and 2.frequency module, passive Q switch. PIN photo diode on optical rider, cylindrical lens of f = +15mm, +25mm, +45mm, colliminator lens of f= +75mm,focusing lens f= +75mm, filter holder with filters, polarization filter and transport case.  **Or**  **Equivalent Specification.** | 10 Nos |  |  |
|  | **Magnets Horseshoe:**  Horseshoe magnet Alnico magnet with screw**,** Poles marked red and green pole Area approx. 20x10mm2. Distance between poles approx. 50mm length of shank approx. 70mm. | 10 Nos |  |  |
|  | **Parallel plate capacitor with Accessories**:  A fixed and a moveable plate on a guide rail having centimeter scale, plate separation can be finally adjusted and read off from display to an accuracy of 1/10mm plate spacing: 0-160mm,plate area 500cm2 plates solid casting. Plates can be adjusted between 0 and 20mm via a sindle.  **Accessories:**  Plastic dielectric plate 300x300x2mm3approx  Plexiglass dielectric plate 300x300x2mm3 approx | 10 Nos |  |  |
|  | **Electric field meter (230V,50Hz.) with Accessories:**  Maximum output voltage: 10 VIV output can correspond to 100V/c,300V/cm,1000V/cm,10V,30V, 100V(with Ix voltage measurement plate), 100V,300V,1000V( with 10 x voltage measurement plate), I capacitor measurement plate 250cm2 set Plexiglas spacers, Drip cup basin. | 10 Nos |  |  |
|  | **Center of gravity apparatus:**  Comprises a rod mounted on a base with a suspension screw at the top and four laminas of clear acrylic - 1 each of circular, triangular, square and trapezoidal. Each lamina has suspension holes along their periphery. | 10 Nos |  |  |