The Islamia University of Bahawalpur

TENDER NOTICE

Sealed Tenders are invited from the Firms, Authorized Distributors/Dealers/Supplier having established credentials in terms of Technical, Financial and Managerial capabilities for the supply of **Equipments** for University College of Engineering & Technology, The Islamia University of Bahawalpur as per details given below on C&F basis:

Tender No.	Category	Estimated Cost	Bid Security (2%)
A	Supply of Fluid Mechanics Laboratory Equipment (Qty. & Specifications as available in Tender Documents)	**Rs. 30,100,000/-**	**Rs. 6,02,000/-**
B	Supply of Engineering Mechanics Laboratory Equipment (Qty. & Specifications as available in Tender Documents)	**Rs. 34,330,000/-**	**Rs. 6,86,600/-**
C	Supply of Structure Laboratory Equipment (Qty. & Specifications as available in Tender Documents)	**Rs. 36,610,000/-**	**Rs. 7,32,200/-**
D	Supply of Cement Testing Laboratory Equipment (Qty. & Specifications as available in Tender Documents)	**Rs. 11,800,000/-**	**Rs. 2,36,000/-**
E	Supply of Concrete Material Laboratory Equipment (Qty. & Specifications as available in Tender Documents)	**Rs. 15,100,000/-**	**Rs. 3,02,000/-**

1. Interested bidders may get the Tender Documents containing detailed specifications, terms and conditions from the Purchase Section, Treasurer's Office Abbasia Campus, the Islamia University of Bahawalpur during the office hours 8:00 A.M. to 4:00 P.M. on submission of written application on letter head and a copy of CNIC or can be downloaded from the IUB website www.iub.edu.pk or PPRA website www.ppra.punjab.gov.pk on payment of (Non Refundable Fee) of Rs.1000/- (separately for each category) through Bank challan HBL in A/C 14730000010403 or pay order in the name of the Treasurer Islamia University of Bahawalpur for bidding documents.
2. **02% bid security** of the **Total Estimated Cost** as mentioned above separately in each category (Refundable) in shape of CDR shall be attached with the bid, otherwise the bid will be rejected.
3. **Single Stage – Two Envelopes** bidding procedure will be adopted as per PPRA Rules 38- 2(a). The Envelopes shall be marked as "**TECHNICAL PROPOSAL**" and **"FINANCIAL PROPOSAL**" in legible letters. Financial Proposal of bids found technically non-responsive shall be returned un-opened.
4. Procurement shall be governed under the Punjab Procurement Rules, 2014.
5. The rates should be quoted inclusive of all taxes. Copy of paid bank challan Professional tax also be provided.
6. The Islamia University of Bahawalpur however, reserves the right to reject all bids at any time prior to acceptance of a bid as per clause 35 of the Punjab Procurement Rules and grounds of rejection will be conveyed to the bidders upon their request.
7. Tender should reach in the Office of the Chairman (SMPC), Department of Mathematics, The Islamia University of Bahawalpur upto **17.10.2017** by **2.00 P.M** Tenders will be opened on the same day at **2.30 P.M** in the presence of bidders or their representatives.
8. All bids submitted after the given time shall not be accepted.
9. All Taxes will be applicable as per Govt. Rules & Regulations.
10. The rates should be valid upto 120 days from the date of opening the tender.
11. In case of closed/forced holidays, tender opening time/date will be considered as the next working day.

Chairman SMPC
The Islamia University of Bahawalpur
Baghdad-ul-Jadeed Campus, Bahawalpur.
Phone: 062-9255473

IPB-1118

Tender-A: Fluid Mechanics Laboratory

Sr	Items	Qty	Specifications
1	**Hydraulic Bench for Experiments in Fluid Mechanics (2 variable speed pump and speed display)**	**09**	**Required features in the experimental setup:** Hydraulic Bench; base module for supplying experimental units in fluid mechanics, closed water circuit with storage tank, submersible pump and measuring tank, measuring tank divided in two for volumetric flow rate measurements, measuring beaker with scale for very small volumetric flow rates, measurement of volumetric flow rates by using a stopwatch, work surface with integrated flume for experiments with weirs, work surface with inside edge for safe placement of the accessory and for collecting the dripping water, storage tank, measuring tank and work surface made of GRP. Complete with all necessary accessories and instruments. **Dimensions of the Items:** Pump; power consumption: 250W, max. flow rate: 150L/min, max. head: 7.6m, Storage tank, capacity: 180L. Measuring tank; at large volumetric flow rates: 40L, at small volumetric flow rates: 10L. Flume; LxWxH: 530x150x180mm, Measuring beaker with scale for very small volumetric flow rates, capacity: 2L, Stopwatch; measuring range: 0-9h 59min 59sec.
2	**Experimental Setup for Dead Weight Calibrator (calibration of bourdon tube pressure gauge)**	**01**	**Required features in the experimental setup:** Bourdon tube pressure gauge for pressure measurement, transparent dial face with a view of the spring mechanism, accurately fitting piston and cylinder of the piston manometer without seals, hydraulic oil for transfer of the force, hydraulic pump with storage tank and bleed mechanism.**Dimensions of the Items:** Piston manometer; pressure piston: diameter: 12mm. Hydraulic cylinder: diameter: 25mm, length=225mm.Oil: ISO viscosity gradeVG 32. Set of weights; weight holder: 385g / 0.334bar, 1x 193g / 0.166bar, 4x 578g / 0.5bar. Measuring range; pressure: 0-2.5bar.
3	**Experimental Setup for Hydrostatic Pressure**	**01**	**Required features in the experimental setup:** investigation of the hydrostatic pressure in fluids at rest, tiltable water tank with fill level scale, lever arm with different weights.**Specifications of the items:** Water tank; inclination angle: 0°-90°, content: 0-1.8L, scale: 0-250mm, effective area max. 75x100mm. Lever arm; max. length 250mm. Weights; 1x 2.5N, 1x 2N, 2x 1N, 1x 0.5N.
4	**Experimental Setup for Flow Over Weirs**	**01**	**Required features in the experimental setup:** experimental unit for visualisation of various flow processes, illuminated flow section with transparent front panel, open-channel flow demonstrated on 2 weirs, flow through demonstrated with 3 differently shaped models, flow around solid bodies demonstrated on four drag bodies, contrast medium: ink, optional operation via laboratory supply or as closed water circuit. **Dimensions of the Items:** Flow section: approx. 5L, Contrast medium: ink. Injection of the contrast medium; 5 nozzles. Pump; flow rate: 10L/min, head: 5.7m. Weirs; broad-crested, sharp-crested. Drag body; 2 cylinder cross-sections, aerofoil, symmetrical aerofoil, asymmetrical. Models (different shapes), gradual contraction / sudden enlargement, sudden contraction / enlargement, tube bundle.
5	**Experimental Setup for Metacentric Height**	**01**	**Required features in the experimental setup:** investigating the stability of a floating body and determining the metacenter, transparent floating body with rectangular frame cross-section, one horizontally movable clamped weight for adjusting the heel, one vertically movable clamped weight for adjusting the centre of gravity, clinometer with scale for displaying the heel, other floating bodies with different shapes of frame, determination of the metacentre of 2 floating bodies with different frame shapes, 1 shape of frame: hard chine, 1 shape of frame: round bilge. **Dimensions of the Items:** Floating body; LxWxH: 300x130x190mm. mast height: 400mm. Horizontal scale: 180mm. Vertical scale: 400mm. Height scale of the floating body: 120mm. Clinometer scale: +/- 35°. Weights; floating body without clamped weights: approx. 2.7kg, vertical clamped weight: 575g, horizontal clamped weight: 196g. Tank for water: 50L. Hard chine frame: LxWxH 300x200x140mm. Round bilge frame: LxWxH 300x200x100mm. Mast length: 240mm. Horizontal scale: 180mm. Vertical scale: 240mm. Height scale of the floating body: 120mm. Scale for heel: +/- 35°. Weights; floating body without clamped weights: hard chine: approx. 2.9kg, round bilge: approx. 2.4kg, vertical clamped weight: 575g, horizontal clamped weight: 196g
6	**Experimental Setup for the Demonstration of Bernoulli's Theorem**	**01**	**Required features in the experimental setup:** familiarization with Bernoulli's principle, Venturi nozzle with transparent front panel and measuring points for measuring the static pressures, axially movable Pitot tube for determining the total pressure at various points within the Venturi nozzle, 6 tube manometers for displaying the static pressures, single tube manometer for displaying the total pressure.**Dimensions of the Items:** Venturi nozzle; A: 84-338mm², angle at the inlet: 10.5°, angle at the outlet: 4°, Pitot tube; movable range: 0-200mm, diameter: 4mm. Pipes and pipe connectors: PVC, Measuring ranges; static pressure: 0-290mmWC, total pressure: 0-370mmWC.
7	**Experimental Setup for the Demonstration of Impact of Jet**	**01**	**Required features in the experimental setup:** investigation of jet forces and demonstration of the principle of linear momentum, tank made of transparent material for observing the experiments, nozzle for generating the water jet, jet force adjustable via flow rate, four different shaped deflectors: (flat surface, oblique surface, semi-circular surface, conical surface), measurement of the jet forces via weight-loaded scale.**Dimensions of the Items:** Tank; inner diameter: 200mm, height: 340mm. Nozzle; diameter: 10mm. Deflector; flat surface: 90°, oblique surface: 45°/135°, semi-circular surface: 180°, conical surface: 135°. Weights; 4x 0.2N, 3x 0.3N, 2x 1N, 2x 2N, 2x 5N.

8	**Experimental Setup for the Demonstration of Orifice Discharge for Basic & Advanced Orifice Studies**	**01**	**Required features in the experimental setup for Orifice Plate Flow Meter with Transducer:** orifice Plate Flow Meter with electronic differential pressure transducer for flow rate measurement, operation based on the differential pressure method, display indicating differential pressure, connections to facilitate pressure loss measurement, connections to supply auxiliary power, vertical and horizontal installation possible. Setup should cover advanced orifice studies. Orifice plate material: brass. diameter: 18,5mm, with 45° chamfer. Transducer; measuring range: 0-500mbar, Pipe connections: DN 32
9	**Experimental Setup for the Demonstration of Energy Losses in Pipes and piping elements**	**01**	**Required features in the experimental setup are Pipe Friction for Laminar/Turbulent Flow, Losses in Pipe elements and systems:**investigation of the pipe friction in laminar or turbulent flow, transparent tank with overflow ensures constant water inlet pressure in the pipe section for experiments with laminar flow, flow rate adjustment via valves, twin tube manometers for measurements in laminar flow, dial-gauge manometer for measurements in turbulent flow. investigation of pressure losses in piping elements and shut-off devices, different measuring objects for determining flow rate according to the differential pressure method. Pipesections capable of being individually shut off, with different piping elements: sudden contraction, sudden enlargement, Y-pieces, T-pieces, corners and bends, one pipe section to hold interchangeable shut-off/measuring objects, measuring objects made of transparent material: Venturi nozzle, orifice plate flow meter and measuring nozzle, shut-off devices: angle seat valve, gate valve, annular chambers for measurement of pressure without interaction, 2 twin tube manometers for measuring the pressure difference. Investigationof the pressure loss in flow through pipe fittings and in the ball valve, sudden contraction and sudden enlargement, pipe bend, segment bend, pipe angle and ball valve as measurement objects,annular chambers allow precise measurement of pressure, 6 tube manometers for displaying the pressures, Bourdon tube pressure gauge for pressure measurement. Setup should cover advanced studies of piping systems. Complete with all necessary accessories and instruments.
10	**Experimental Setup for Flow Meter Demonstration**	**01**	**Required features in the experimental setup:**different methods of flow rate measurement, measuring instruments: orifice plate flow meter/measuring nozzle, Venturi nozzle and rotameter, 6 tube manometers to determine the pressure distribution in Venturi nozzle, orifice plate flow meter and measuring nozzle, measurement of the total pressure with Pitot tube. **Dimensions of the Items:**Venturi nozzle: A=84-338mm², angle at the inlet: 10.5°, angle at the outlet: 4°. Orifice plate flow meter: diameter r=14mm. Measuring nozzle: diameter=18.5mm. Rotameter: max. 1700L/h. 6 tube manometers: 390mmWC.
11	**Experimental Setup for the Demonstration of Free and Forced Vortices**	**01**	**Required features in the experimental setup:** generation and investigation of vortices, transparent tank allows visualisation of vortex formation, two nozzles for radial water supply (free vortex), two nozzles for tangential water supply (forced vortex), different inserts for the water drain to generate free vortex, impeller for generating a forced vortex, point gauges detect the surface profile. **Dimensions of the Items:**Tank; diameter: 250mm, height: 190mm. 4 inserts for the water drain; diameter: 8, 12, 16 and 24mm. Impeller with 3 blades, Vertical point gauge; 6 movable rods. Horizontal point gauge; 2 movable rods. Measuring tube; movable, horizontal 0-90mm, vertical 70-190mm, diameter: 4mm.
12	**Experimental Setup for the Demonstration of Pressure Surge in a Pipe**	**01**	**Required features in the experimental setup:** formation and effect of water hammer, pumping using water hammer, fixed overflow tank is used as a water source, e.g. river, pool. elevated tank with variable pump head, waste valve with adjustable lift, cyclic closure due to flow force of the water, tank with check valve and air volume is used as an air vessel, air volume in the air vessel variable by vent valve, flow rate measurement. **Dimensions of the Items:**Ram; max. head 0.27m, max. flow rate: 90L/h
13	**Hydrostatic Bench**	**01**	Independent and self-contained unit for the study of fundamental properties of non-moving fluids like density, relative density, pressure variation with head, hare's tube, Pascal's law, viscosity, capillary, surface tension, Archimedes, Vernier level gauge and hydraulic press.
14	**Osborne Reynolds Experiment**	**01**	**Osborne Reynolds Experiment, Required features in the experimental setup:** visualization of laminar and turbulent flow in the Osborne Reynolds experiment, water as flowing medium and ink as contrast medium, vertical glass pipe section, water tank with glass beads to stabilize the flow, flow rate in the pipe section can be adjusted via a valve. **Dimensions of the item:**Water tank; capacity: 2200mL. Pipe section; length: 675mm, inside diameter: 10mm, Tank for ink; capacity: approx. 250mL.
15	**Laminar Flow Table**	**01**	**Required features in the experimental setup:**visualisation of streamlines, water as flowing medium and ink as contrast medium, upper glass plate, hinged for interchanging models, bottom plate with water connections for generating sources/sinks, sources/sinks can be combined as required, different drag bodies and changes in cross-section included, rubber plate for creating any models, flow velocity, water supply and water drain in sources/sinks as well as adjustable dosage of the contrast medium by valves. **Dimensions of the Items:** Flow chamber contains two plates; distance between the plates 2mm, upper plate made of glass, bottom glass plate with four water connections for sources/sinks, size experiment area: LxW: 400x280mm, 10 drag bodies and changes in cross-section, Rubber plate for your own models LxH: 300x400mm, thickness: 2mm. Injection of the contrast medium (ink) with 15 holes. Tank for contrast medium: 500mL

16	**Miniature Flow Channel-650mm for Flow Channel Demonstration**	**01**	**Required features in the experimental setup:** Flow of water along an open channel and to visualize flow around objects in the path the injection of ink. With triangular hump section and an undershot weir for demonstration of specific energy/depth relationships.Visualizationof streamlines during incident flow and flow around various weirs and drag bodies, transparent experimental flume, incident flow demonstrated on two weirs, demonstration of flow around four different drag bodies, contrast medium: ink, distributor for contrast medium with seven nozzles, water level in the experimental flume adjustable via sluice gate at the water inlet and weir at the water outlet, flow straightener for even, non-vortical water inlet. Dischargemeasurement in open channels using 2 measuring weirs, Thomson weir with V-profile, Rehbock weir with rectangular profile, level gauge with scale for determining the head, level gauge capable to be positioned anywhere along the experimental flume.visualization of streamlines water as flowing medium and ink as contrast medium, upper glass plate, hinged for interchanging models, bottom plate with water connections for generating sources/sinks, sources/sinks can be combined as required, different drag bodies and changes in cross-section included, rubber plate for creating your own models included, flow velocity, water supply and water drain in sources/sinks as well as adjustable dosage of contrast medium by valves.
17	**Multi-Purpose Teaching Flume (5 meters)**	**01**	**Required features in the experimental setup:** basic principles of open-channel flow, experimental flume with experimental section, inlet and outlet element and closed water circuit, length of the experimental section 5m, smoothly adjustable inclination of the experimental section, experimental section with 10 evenly spaced threaded holes on the bottom for installing models or for water level measurement using pressure, side walls of the experimental section made of tempered glass for excellent observation of the experiments, all surfaces in contact with water made of corrosion-resistant materials, flow-optimised inlet element for low-turbulence entry into the experimental section, closed water circuit with water tank, pump, flow rate sensor and manual flow adjustment. With inclinometer and surface profile measuring instruments for Chezy equation and Mannings friction factor. **Dimensions of the Items (approx.):**Experimental section; length: 5m, flow cross-section WxH: 86x300mm, inclination adjustment: -0.5-+3%, Tank: 280L, Pump; power consumption: 1.02kW, max. flow rate: 22.5m³/h, max. head: 13.7m, Flow rate measuring range: 0-10m³/h.
18	**Advanced Multi-Purpose Teaching Flume (10meters)**	**01**	**Required features in the experimental setup:** basic principles of open-channel flow, experimental flume with experimental section, inlet and outlet element and closed water circuit, length of the experimental section 20m, smoothly adjustable inclination of the experimental section, experimental section with 20 evenly spaced threaded holes on the bottom for installing models or for water level measurement using pressure, side walls of the experimental section made of tempered glass for excellent observation of the experiments, all surfaces in contact with water made of corrosion-resistant materials, flow-optimised inlet element for low-turbulence entry into the experimental section, closed water circuit with water tank, pump, flow rate sensor and manual flow adjustment. With inclinometer and surface profile measuring instruments for Chezy equation and Mannings friction factor. Experimental section; length: 20m, flow cross-section WxH: 600x500mm, with appropriate inclination adjustment.
19	**Pitotstatic Tube**	**01**	**Required features in the experimental setup:** determination of discharge velocity for the experimental flume, determination of velocity via differential pressure, holder with vertical scale to indicate the position of the pitotstatic tube, hoses connect the pitotstatic tube and the battery-operated differential pressure display. **Dimensions of the Items:**Scale: 0-800mm, graduation: 1mm. Measuring range: differential pressure 0-140mm, graduation: 0.1mbar
20	**Apparatus for Turbine Experiments**	**01**	**(a) Pelton Turbine, required features in the experimental setup:** Operating Principle of a Pelton Turbine, function of a Pelton turbine, transparent front panel for observing the operating area, loading the turbine by use of the band brake, adjustable nozzle needle for setting different nozzle cross-sections, marking on brake drum for non-contact speed measurement, instruments: spring balances for determining the torque, manometer shows pressure at turbine inlet. **Dimensions of the Items:**Pelton turbine; output: 5W at 500min-1, approx. 30L/min, H=2m. Pelton wheel; 14 blades, blade width: 33.5mm, external diameter: 132mm. Needle nozzle; jet diameter: 10mm. Measuring ranges; braking force (spring balance): 10N, pressure: 0-1bar **(b) Francis Turbine, Required features in the experimental setup:** Operating Principle of a Francis Turbine, function of a Francis turbine, transparent front panel for observing the operating area, loading the turbine by use of the band brake, adjustable guide vanes for setting different angles of attack, marking on brake drum for non-contact speed measurement, instruments: spring balances for determining the torque, manometer shows pressure at turbine inlet.**Dimensions of the Items:** Turbine; output: 12W at 1100min-1, approx. 40L/min, H=8m, rotor-7 blades, blade width: 5mmexternal diameter: 50mm. guide vanes: 6 vanes, adjustable (20 stages). Measuring ranges: braking force (springbalance): 10N, pressure: 0-1.0bar.

			(b) Kaplan Turbine, Required features in the experimental setup: Operating Principle of a Kaplan Turbine, function of a Kaplan turbine, transparent front panel for observing the operating area, loading the turbine by use of the band brake, adjustable guide vanes for setting different angles of attack, marking on brake drum for non-contact speed measurement, instruments: spring balances for determining the torque, manometer shows pressure at turbine inlet.**Dimensions of the Items:** Turbine; output: 12W at 1100min-1, approx. 40L/min approx.
21	**Experimental Setup for Series and Parallel Pumps + Centrifugal Pump**	**01**	**Required features in the experimental setup for Series and Parallel Configuration of Pumps AND Centrifugal pumps:** investigation of series and parallel configuration of pumps, two identical centrifugal pumps, transparent tank as intake tank, overflow in the tank ensures constant suction head, ball valves used to switch between series and parallel operation, manometers at inlet and outlet of each pump. Investigationof a centrifugal pump, drive with variable speed via frequency converter, ball valve to adjust the head, manometers on the inlet and outlet side of the pump, digital display of speed and power. **Dimensions of the Items:** 2x centrifugal pump, power consumption: 370W, max. flow rate: 21L/min, max. head: 12m. Tank: 13L. Pipes and pipe connections: PVC, Measuring ranges; pressure (inlet): 2x -1-1.5bar, pressure (outlet): 3x 0-2.5bar Centrifugal pump, self-priming, max. flow rate: 3000L/h, max. head: 36.9m. Asynchronous motor, nominal power: 370W. Measuring ranges; pressure (outlet side): -1-5bar, pressure (inlet side): -1-1.5bar, speed: 0-3000/min, power: 0-1000W.
22	**Multi-Pump Test Rig**	**01**	Self-contained multi-pump rig for the detailed investigation on both rotodynamic and positive displacement pumps. Complete with positive displacement gear pump, positive displacement piston pump,positive displacement vane pump,rotodynamic centrifugal pump, rotodynamicaxial pump,rotodynamic channel impeller pump.
23	**Boundary layer Plate**	**01**	An apparatus for the experimental study of the thickness of the boundary layer, where fluid flow meets a stationary surface and investigate the velocity profile within the layer. Complete with all necessary accessories and instruments.
24	**Permeability apparatus with drainage and seepage tank**	**01**	An apparatus for the experimental study of flow through a permeable media with foundation pressure plate, straight and curved permeable membranes and tile drain(with complete instrumentation for lab experimentation). A facility for the study of flow line visualization, determination of seepage rates, flow net construction, verification of Darcy's law, seepage under dams, abstraction from wells and hydrostatic forces exerted on bridge foundations. Complete with all necessary accessories and instruments.
25	**Irrigation displays (sprinkler & trickle system)**	**01**	A single apparatus for the demonstration of physical processes found in hydrology, like relationship between rainfall and runoff as a function of time, Storm hydrographs from single or multiple storms, storm hydrograph from a previously saturated catchment, storm runoff from an impermeable catchment, effect of a moving storm on flood hydrograph, effect of land drains on flood hydrograph. Overall Tank dimensions (Length: 1.25m, Width: 0.80m, Height: 0.20m), flow meter range (0.40-6 l/min), and with runoff collector (17 x 0.55 compartments). Complete with all necessary accessories and instruments.
26	**Advanced hydrology study & Rainfall system**	**01**	A self-contained floor standing apparatus with complete instrumentation for hydrology and fluvial geomorphology demonstrations, basin hydrology cycles, flood & runoff hydrographs, effects on bridges/dams, interaction of adjacent wells and elementary fluvial processes like erosion on hillsides and river meander. Comprisingof a 2m x 1m stainless steel tank and flow meters with range 2.5 l/min to 8 l/min. Complete with all necessary accessories and instruments. **Accessories:** **Barometer:** A single digital barometer with overall dimensions 90mm x 180mm x 25mm, pressure range 700 to 1,500 mbar, humidity range 25 to 95%, temperature range -5 to 80°C, accuracy range ±0.1480Hg - ±5 mbar - ±5 %RH - ±1°C and powered by 4 x AAA (LR03) battery with voltage range 1.50 to 2.50 V. **Non- recording rain gauge:** standard rain gauge which give total amount of precipitation in 24 hours (a full day), can hold 500 to 750 mm of rain water, with all accessories for lab performance. SNOW GAUGE An instrument with copper catchment container with 45 to 570 cm length and funnel shaped gauge for the measurement of solid precipitation, with all accessories for lab performance. **Tipping bucket rain gauge:** A rain gauge with 30 cm dia. receiver, resolution range 0.1 to 0.35 mm per tip, accuracy range 2% up to 25 mm/hr 5% up to 70 mm/hr, with complete recording arrangements. **Evaporation pan with hook gauges:** Singe evaporation pan With Thermometer and hook gauge with range of adjustment 100mm (micrometer moves 1mm to 1.5 mm per turn).
27	**Sediment Transport Demonstration Channel**	**01**	An apparatus for the demonstration of full range of forms that arise in a mobile bed as the flow rate and/or slope is varied. With study of the movement of sediment around structures for sourcing and blockage. Complete with all necessary accessories and instruments. **Accessories:** **Current meter:** To measure flow rate of an open channels.

28	**Demonstration infiltration apparatus**	**01**	An apparatus for the demonstration of infiltration processes. It consists of three graduated Perspex cylinders, resting on a permeable support screen, complete apparatus is supported by a metal stand or bench mounted (with complete accessories for lab performance).Complete with all necessary accessories and instruments.
			Total Estimated Cost = 30.10 Millions PKR

Note:

1. **All items must be of USA, Japan, Germany, UK, France, Italy, Spain, Belgium, Netherland, Finland, Switzerland & Sweden's Manufacturer.**
2. **Quoted hardware must be compatible with lab power supplies and other equipment as per requirement.**
3. **Equipment shall be delivered with all necessary supplies and accessories required for installations and start-up.**
4. **The vendor shall demonstrate and document upon installation that the system meats all performance specifications.**
5. **Comprehensive documentation including Safety/Installation Guidelines and Operation/Experiment Manuals should accompany the product, both in Hard and Soft/CD/eBook formats FOR ALL ITEMS.**
6. **All items (1-28) of this lab will be technically & financially evaluated as a group. But the bidders are still required to quote individual prices of the items.**

Tender-B: Engineering Mechanics Laboratory

Sr.	Items	Qty	Specifications
1	**Experimental setup for Torsional Vibration Apparatus**	**01**	**Required features in the experimental setup:** Torsional vibrations on different torsion bars, five aluminum torsion bars with different diameters (Approx. length: 1100mm, diameter: 2mm, 3mm, 4mm, 5mm, 6mm), adjustable effective length of the torsion bars, quick-action chucks to swap components, generate torsional vibration via a circular disk (approx. moment of inertia 0.0096kgm^2) or circular ring (approx. moment of inertia 0.01335kgm^2), stopwatch to measure the oscillation period, bracket for wall mounting.
2	**Experimental setup for Vibration of a Spiral Spring**	**01**	**Required features in the experimental setup:** investigate vibrations on a spring-mass system, lever with sliding mass to deflect the helical spring (Specs; cross-section: 10x1mm, spring length: approx. 800mm, inner radius: 10mm, outer radius: 50mm, winding distance: 8,5mm, Sliding mass: 2x 0,5kg), adjustable distance of the mass to the rotation axis (around 36-150mm), angle scale for reading the angle of deflection (max. 360° & graduation: 1°), stopwatch to measure the oscillation period, determine the natural frequency and the spring stiffness, bracket for wall mounting.
3	**Experimental setup for Friction on an Inclined Steel Plane**	**01**	**Required features in the experimental setup:** experiment relating to friction on the inclined plane, inclined plane with plastic coating, drag link with angle scale and ball bearing-mounted deflection roller, angle of plane adjustable, 2 samples, graduated weight set, Friction body (Specs; LxWxH: each 80x60x44mm, dead-weight force: each 10N, 1x steel / polypropylene, 1x aluminum / brass), Inclined plane (Specs; length: 1000mm, adjustable angle range: ±45°), Weights;(1x 1N (hanger), 4x 0,1N, 1x 0,5N, 4x 1N, 1x 5N).
4	**Bearing Friction Apparatus**	**01**	**Required features in the experimental setup:** comparison of dynamic friction and rolling friction, experiments on rotational dynamics are possible, bearing shells of different materials as slide bearings, steel flywheel (galvanized), drive via cable drum and weights, storage system for parts, bracket for wall mounting. **Dimensions of items:** Bearing shells as slide bearing, half-shells (GG-25, red bronze, PTFE -Teflon), Deep-groove ball bearing (type 6203, Shaft bearing journal, Ø=17mm), Flywheel (Ø=300mm, weight: 22.2kg), Weights (1x 1N (hanger), 5x 1N, 1x 2N, 3x 5N), Base plate (LxW: 250x200mm).
5	**Energy of a Flywheel Apparatus**	**01**	**Required features in the experimental setup:** investigate the inertia of a flywheel, generate a uniformly accelerated rotational motion of the flywheel, driven by weights, influence of weight on time taken to roll down, measure the time and the acceleration distance, determine the mass moment of inertia, bracket for wall mounting, **Dimensions of items:** Flywheel (diameter: 300mm, thickness: 40mm, mass: 22,2kg), Shaft (diameter: 22mm), Weight for the drive; (1x 1N (hanger), 4x 1N, 3x 5N).
6	**Shearing Force Apparatus**	**02**	**Required features in the experimental setup:** investigation of shear force on beam mounted on 2 supports, measurement of shear force in beam by low-friction hinge with 1 degree of freedom, position of hinge at 1/3 span, 2 bearing supports, loading of beam by 1 to 3 point loads, force gauge to indicate shear force, adjusting nut for horizontal alignment of beam, storage system to house the components. Specimen; (diameter x l: 6x26mm, made of electrical grade copper).
7	**Bending Moment Apparatus**	**02**	**Required features in the experimental setup:** investigation of bending moment on beam mounted on 2 supports, indication of bending moment in beam by low-friction hinge with 1 degree of freedom, position of hinge at 1/3 span, 2 bearing supports, loading of beam by 1 to 3 point loads, force gauge and lever arm to indicate bending moment, adjusting nut for horizontal alignment of beam, storage system to house the components, **Dimensions of items:** Beam; (total length: 1000mm, span: 800mm), Bending moment measuring range: 10Nm, Weights; (3x 1N (hanger), 12x 1N, 9x 5N, max. weight per hanger: 20N).
8	**Centrifugal Force Apparatus**	**01**	**Required features in the experimental setup:** measure the centrifugal force on rotating masses, adjustment of the orbital radii, selection of different masses, continuous adjustment of the speed, drive with DC motor, transmission of centrifugal force via the connecting rod and member to a bending beam, force-proportional deformation of the bending beam, measure the centrifugal force via an inductive position transducer on the bending beam, digital display of force and speed, protective cover with electronic coupling to the drive ensures safe operation. **Dimensions of items:**Orbit (orbital radii: 25mm, 50mm, 75mm, 100mm, 125mm & max. velocity: 6,5m/s), Masses; (50g, 75g, 100g), Drive motor; (max. power: 35W, max. speed: 6000min^{-1}), Measuring ranges; (speed: 0…500min^{-1}, force; (0-25N, resolution 0.1N).

9	**Setup for Deformation of frames with mounting Frame**		**Required features in the Mounting Frame;** frame for mounting of experiments in statics, strength of materials and dynamics, sturdy sectional steel double frame(welded), easy & exact mounting of all components by precision clamp fixings, stable on laboratory desktops or workbenches, frame supplied disassembled. **Dimensions of items:** Mounting frame made of steel sections (frame opening WxH: 1250x900mm, section groove width: 40mm). **Required features in the Deformation of frames setup;** investigation of the deformation of steel frames under load, 1 U-shaped and 1 S-shaped frame, statically determinate or statically indeterminate bearing support possible, 1 long and 1 short clamping pillar, roller bearing for statically indeterminate support, weights with a movable hook to adjust to any load application point, dial gauges record the deformation of the investigated frame under load, storage system to house the components. **Dimensions of items:** Frame made of steel (edge length: 600mm, cross-section: 20x10mm, U-shaped: 600x600mm, S-shaped: 600x600mm), Dial gauges: (measuring range: 0-20mm, graduation: 0.01mm), Weights: (2x 1N (hanger), 8x 1N, 6x 5N).
10	**Hook's Law Apparatus**	**01**	**Required features in the experimental setup:** experiments relating to Hookes law and oscillation experiments on a spring-mass system, metal stand with integral scale, 2 helical spring as tension springs, tension springs configured in series or singly, load applied to tension spring by weights, storage system to house the components. **Dimensions of items:**Helical spring short; (coils: 53, Ø =18,3mm, wire diameter: Ø=1,0mm), Helical spring long; (coils: 109, Ø =18,3mm, wire diameter: Ø=1,0mm), Scale graduation: 1mm, Weights; (1x 1N (hanger), 10x 0,5N).
11	**Plastic Bending of Beams**	**02**	**Required features in the experimental setup:** study a beam until plastic deformation, load on the beam from point load, fixed and movable support for supporting the beam, beams of different materials and profiles, dial gauge for recording the deformation, storage system for parts. **Dimensions of items:** Beams: (1x 1000x15x3mm, steel), (1x 1000x15x3mm, aluminium), (1x H-profile, 1000x15x15x2mm, aluminium), Load application device: (max. load: 5000N, max. travel: 100mm), Measuring range: 0-50mm.
12	**Experimental setup for Forces in Truss**	**02**	**(a) Experimental setup for Forces in various single plane trusses.** Required features in the experimental setup:investigation of bar forces in a statically determinate truss, construction of various trusses possible, 2 supports with node disks, load application device with force gauge mountable on different node disks, measuring points to measure force on each bar, storage system to house the components. **Dimensions of the Items;**Bars: 19 (2 bars 150mm, 5 bars 259mm, 7 bars 300mm, 1 bar 397mm, 3 bars 424mm, 1 bar 520mm), angle between bars: (30°, 45°, 60°, 90°), maximum bar force: 500N, measuring points on each bar, height of truss max. 450mm, length of truss max. 900mm, Load application device; ±500N& graduation: 10N **(b) Experimental setup for Forces in an over-determinate truss.** Required features in the experimental setup:investigation of bar forces in statically over-determinate trusses, surplus bar, longitudinally adjustable, straight and inclined loading possible, load application device with force gauge mountable on different node disks, measuring point to measure force on each bar, measuring amplifier, storage system to house the components. **Dimensions of items;**Bars: 8 (5 bars-fixed 300mm, 2 bars-fixed 424mm, 1 bar-adjustable 400-450mm), angle between bars: (30°, 45°, 60°, 90°), maximum bar force: 500N, measuring point on each bar, height of truss max. 270mm, length of truss max. 500mm, Load application device; ±500N & graduation: 10N, Dial gauge: measuring range: 0-20mm **(c) Forces in a Howe truss** Required features in the experimental setup:investigation of bar forces in a single plane, statically determinate truss, ready assembled Howe truss, frame for horizontal experimental setup, influence of dead weight minimized by horizontal experimental setup, any straight and inclined load cases possible, fine adjustment of load force, low-friction knife-edge bearing, 2 supports for vertical forces, 1 support for horizontal forces, pre-balanced strain gauge connection box with connection to measuring amplifier. **Dimensions of items;**Truss: Howe type, bar cross-section: 10x3mm-stainless steel, bar lengths: (115.5, 200, 231mm), external loading: max. 500N, bars: 13-of which 7 with measuring points, Load application device with force gauge; tensile force: max. 600N, stroke: 30mm, Node disks:8, Angle between bars: (30°, 45°).

			(d) Truss beam: Warren girder Required features in the experimental setup; investigation of bar forces in a single plane, statically determinate truss, ready assembled Warren truss beam, influence of dead-weight minimised by horizontal experiment layout, any straight and inclined load cases possible, pre-balanced strain gauge connection box. **Dimensions of items;** Truss beam: Warren type, bar cross-section: 10x3mm-stainless steel, bar lengths: (270mm, 186.5mm), tensile force: max. 500N, bars: 13-of which 7 with measuring points, Nodedisks: 8.
13	**Three hinged Arch**	**02**	**Three hinged Arch:** Structures range comprising a standard three hinged test frame with loading and measurement facilities plus a series of different test structures which fit into the frame, complemented by structures software for an interactive system for the input of loads and calculation of displacements.
14	**Deflection of Beams**	**03**	**Deflection of Beams:** Structures range comprising a standard test frame for studying deflection of beams with loading and measurement facilities plus a series of different test structures which fit into the frame, complemented by structures software for an interactive system for the input of loads and calculation of displacements.
15	**Flour mounted frame**	**12**	**Flour mounted frame:** Structures range comprising a standard flour mounted test frame for studying deflection of beams with loading and measurement facilities plus a series of different test structures which fit into the frame, complemented by structures software for an interactive system for the input of loads and calculation of displacements. Complete with accessories like load cell displays (12 nos).
16	**Suspension Bridge**	**01**	**Suspension Bridge:** Structures range comprising a standard test frame for studying suspension bridge with loading and measurement facilities plus a series of different test structures which fit into the frame, complemented by structures software for an interactive system for the input of loads and calculation of displacements.
17	**Two hinged parabolic Arch**	**01**	**Two hinged parabolic Arch:** Structures range comprising a standard two hinged test frame with loading and measurement facilities plus a series of different test structures which fit into the frame, complemented by structures software for an interactive system for the input of loads and calculation of displacements.
18	**Universal Structure Testing Frame (20KN, approx.)**	**01**	**Required features:** Classic experiments from destructive materials testing, tensile tests, Brinell hardness test, generation of tensile and compressive forces, forces generated by hand-operated hydraulic system; no power supply required, force gauge, pointer instrument with drag indicator, dial gauge for determining the elongation, materials of hardness specimens: aluminium, copper, steel, brass, tensile specimens according to DIN 50125: aluminium, copper, steel, brass. **Dimensions of items:** Test force: max. 20kN, Stroke: max. 45mm, Free installation space for specimens: 165x65mm Tensile specimens: B6x30mm, DIN 50125, Hardness specimens: LxWxH 30x30x10mm, Sphere for hardness testing: diameter 10mm, Measuring ranges; (force: 0-20kN, graduation: 0. 5kN, displacement: 0-20mm, graduation: 0.01mm)
19	**Universal Structure Testing Frame (50 KN, approx.)**	**01**	**Required features**: hydraulically operated trainer for materials testing, based on industrial standards, generation of tensile and compressive forces, adjustable test load and travel velocity, generation of test load via gear pump and double-acting hydraulic cylinder, force measurement via a strain-gauge full bridge with acoustic overload signal, max. overload 150%, displacement measurement via linear potentiometer, LED displays for force and displacement with tare and maximum-value storage. **Dimensions of items:** Operating area, WxH: 300x925mm, Hydraulic generation of the test load (test load: 0-50kN, max. system pressure: 175bar, max. piston stroke: 150mm, traverse velocity: 0-425mm/min, gear pump (max. flow rate: $1cm^3$/revolution, power consumption: 0.55kW), Measuring ranges; (force: 0-50kN, displacement: 0-150mm), 230V, 50/60Hz, 1 phase operated
			Total Estimated Cost = 34.33 Millions PKR

Note:

1. **All items must be of USA, Japan, Germany, UK, France, Italy, Spain, Belgium, Netherland, Finland, Switzerland & Sweden's manufacturer.**
2. **Quoted hardware must be compatible with lab power supplies and other equipment as per requirement.**
3. **Equipment shall be delivered with all necessary supplies and accessories required for installations and start-up.**
4. **The vendor shall demonstrate and document upon installation that the system meats all performance specifications.**
5. **Comprehensive documentation including Safety/Installation Guidelines and Operation/Experiment Manuals should accompany the product, both in Hard and Soft/CD/eBook formats FOR ALL ITEMS.**
6. **All items (1-17) of this lab will be technically & financially evaluated as a group. But the bidders are still required to quote individual prices of the items.**

Tender-C: Structure Laboratory

Sr	Item	Qty	Specifications
	SERVO-HYDRAULIC UNIVERSAL TESTING MACHINE (2000 kN)	**01**	**SERVO-HYDRAULIC UNIVERSAL TESTING MACHINE (2000 kN)** **Main Features:** • Servo-hydraulic machine, Capacity: 2000 kN, Class 0.5, Compliant with standards: EN10002-2, ASTM E4-16, ISO 7500-1. • Capable of performing tensile, compression, flexural/bending, shearing tests on metallic and non-metallic test pieces. Computer controlled and closed-loop operation. Capable of generating complete stress-strain diagram/table in real time. All test data should be exportable to PC. Machine with more automatic operations will be preferred. • Load, Strain and Position-controlled mechanisms for loading. • Double testing space: Upper for tensile testing and lower for compression & bending tests. 4 hardened steel guiding columns and 2 high precision manufactured screw balls drivers. Extensometry channel for strain gage based extensometers. • Load measuring system: High accuracy load cell, Piston stroke: 300 mm. Displacement transducer: Encoder Displacement: 300 mm, Resolution 0.001 mm, Free horizontal clearance: 950 mm, Free distance between gripping heads (including piston stroke): 0 - 1100 mm, Free distance between compression plates (incl piston stroke): 0 - 950 mm. • Protective system for control electronics, avoids damages to control elements due to: Low voltages and brownouts, High Voltages, Short Circuits. Filter for preventing high frequency disturbances from the power grid. Protection covers for hydraulic group. Instrumentalized control table, includes emergency stop and electrical mains for computer and peripherals. • Latest generation all in one PC (supplied by principals, Local will not be accepted) with touch screen and windows OS including all in one Software Package with appropriate support, keyboard and mouse. Electronic controller units for data acquisition and close loop control of testing instruments. • Remote control:Remote Control For crosshead movements with LED-Graphics Display, keysfor machine's piston, hydraulic gripping head and superior crosshead movements. Magnetic base to allow adaptable ergonomic positioning. Built-in safety emergency push-button. Independent opening and closing of hydraulic gripping heads. Fixed positioning in the testing frame. **Accessories:** **1. Tensile Testing Device consisting of** a) Hydraulic gripping heads with wedge closing system. b) Gripping span: 1100mm. c) Set of jaw holders with the following jaws: 1) Flat pyramid jaws for flat/round samples 0-20 mm thickness and 0-20 mm diameter, 1 set (4 jaws) 2) Flat pyramid jaws for flat samples up to 0-85mm thickness, 1 set (4 jaws). 3) V-jaws for round samples upto 20-90mm Ø, 1 set each (4 jaws) for all intermediate ranges. **2. Compression Testing Device** Set of compression plates with 950mm span and of 220mm Ø size, manufactured in hardened steel, HRC > 55. **3. Three Point Bending & Flexural Devic**e Consisting of: Steel manufactured body with hardened rollers, Punch width: 160 mm, punch tip radii: 30,40. Support span: 900 mm, Supports dia x width: 70x200. **4. Shearing Test Device** For cylindrical specimens up to 30mm diameter. Should be easily fixable into gripping heads of the testing machine.

			5. High Performance Extensometer Extensometer Left through Specimen Fracture. Self-supporting, manual clamping, Measuring principle: Strain gauge, Should not require removal before yielding, Class: 0.5, Compatible with the main machine. For Specimens; Flat specimen from 12 to 31 mm width and 1 to 31 mm thick, Round specimen upto90 mm diameter. Includes high quality foam lined case, spare set of ceramic rods and straight knife edge set. Lo from 10 to 100 mm in 5mm steps, Maximum travel: 30 mm. **Miscellaneous:** • Instruments for measuring sample diameter along with Direct Communication with UTM Software Including with communication cable. Measurement Range: 0-150mm, Resolution: ±0.01mm and Measurement Range: 0-25mm. Resolution: 0.001mm Reference Lock and Unlock preset. • Trolley with wheels to place Tensile Test Specimen and all other accessories to make a working system. • All other necessary accessories required for operation are to be included. • On-site Training by Manufacturer's Engineer must be included. • On-site Installation (including concrete base construction) must be included.
			Total Estimated cost = 36.61 Millions PKR

Note:

1. **All items must be of USA, Japan, Germany, UK, France, Belgium, Spain, Italy, Netherland, Finland and Switzerland's manufacturer.**
2. **Quoted hardware must be compatible with lab power supplies and other equipment as per requirement.**
3. **Equipment shall be delivered with all necessary supplies and accessories required for installations and start-up.**
4. **The vendor shall demonstrate and document upon installation that the system meats all performance specifications.**
5. **Comprehensive documentation including Safety/Installation Guidelines and Operation/Experiment Manuals should accompany the product, both in Hard and Soft/CD/eBook formats FOR ALL ITEMS.**

Tender-D: Cement Testing Laboratory

Sr.	Items	Qty	Specifications
1	**Le Chatellier Apparatus with accessories**	01	Le Chatelier soundness kit for the Standards: British Standard BS6463-4 , Other Standards EN459-2 & equivalent **Accessories:** 1. **Le Chatellier Water Bath:** Painted steel sheet exterior case with a stainless steel bath. Holding capacity of up to 12 Le Chateliermoulds to EN 196-3, BS 6463, NF P15-432, UNE 80102, EN ISO 9597 in a removable rack. Capability to maintain the bath temperature at boiling point by avoiding water evaporation and ensuring that the moulds remain covered by water during the test. 2. **Chattaway spatula:** 3. **Le Chatellier Flask:** 4. **Le ChatellierMould:** 30mm x 30mm mould to determine the cement expansion (soundness) in both cold and boiling water. Chromed finished, brass spring tensioned split cylinder (30mm x 30mm), with two 150mm long pointers. 5. Steam cabinet for soundness of building lime, made of stainless steel chamber and body. 6. **Glass Plate:** 50mm x 50mm glass plate 7. 17mm Tamping Rod 8. Extensibility of Mould Apparatus to check the elasticity of the split cylinder of the Le ChatelierMould, complete with 300g weight. 9. 100g Weight - Le Chatelier for use with Le ChatelierMould and Glass Plate
2	**Length comparator (digital version)**	01	Length comparator digital version **Standards:** EN 1367-4, UNI 8147, UNI 8148, EN 12617-4, EN 12808-4, ASTM C151, ASTM C490, UNI 8520:22, UNI 6687, EN 680. **Features:** Length comparator digital version. Comprehends digital gauge with output for PC connection. With serial cable for PC connection including digital gauge 12.5x0.001 mm with serial output for PC connection.
3	**Shrinkage mould**	01	Hydraulic Shrinkage mould for 40 x 40 x 160 mm mortar prisms to EN 12617-4 and NF P15-413 **Standards:** EN 12617-4, EN 12808-4, UNI 6687, NF P15-433. **Features:** Mouldfor determination of linear shrinkage of cement mortars. Made of special alloy steel, minimum hardness HV200. Complete with Contacts points, Rod 160 mm long & plastic inserts.
4	**High pressure cement autoclave**	01	High pressure cement autoclave **Features:** high-pressure steam vessel having a rack for holding about 10 specimens. Complete with pressure gauge, pressure regulator, temperature regulator, control switches, safety valve and specimen rack. Two gang prism mould 25x25x285 mm to ASTM C490 for expansion test of cement with spare contact points (pack of 10).
5	**Blaine apparatus**	01	Blaine apparatus **Standards:** EN 196-6, ASTM C204, AASHTO T153 **Features:** to determine the particle size of Portland cement, limes and similar powders expressed in terms of their specific surface. Consisting stainless steel cell, perforated disc and plunger. **Accessories:** Manometer liquid 250 ml bottle, Reference cement according to EN 196.6 and ASTM C204 - pack of 5g, Glass thermometer -10 + 50c, Spare U-tube glass manometer, Filter paper dia. 12.6mm Pack of 100 pcs.
6	**Apparatus for measurement of bulk density of cement**	01	Apparatus for measurement of bulk density of cement. 1 liter capacity. With sieve funnel, tripod & straight edge.
7	**Heat of hydration calorimeter**	01	Heat of hydration calorimeter with high resolution digital thermometer. **Standards:** EN 196-8, ASTM C186 **Features:** digital high resolution thermometer version, Resolution 0.001°C, System accuracy up to 0.05°C, Instrument memory for up to 10,000 readings, limit alarm, Protection class IP65, PT100 probe measuring range -40 to +300°C. **Accessories:** **1.** Special set of glassware for water content determination including silica combustion tube and water absorption components, BS 4550, UNI 7208 **2.** Paraffin wax 1000g, coating of glass surfaces.

8	**Automatic Vicat Apparatus (with all accessories)**	01	Automatic electronicVicat apparats for setting time & consistency of cement/ mortar/gypsum for the standards BS4550, EN196-3, ASTM C191, C187or equivalent. Large graphic touch-screen colour display, USB port , LAN port for PC connection, LAN cable & suitable software.Complete with EN 196-3 accessories: **Accessories:** 1. Initial Set Needle to EN196-3: 1.13mm diameter to EN/BS and mould 2. Initial Set Needle to ASTM C187, C191: 1mm diameter to ASTM and mould 3. Accessory for needles continuous cleaning and in-water testing. Complete kit. 4. Needle for final setting test conforming to EN 5. Plastic mould conforming to EN. 6. Cylindrical probe for consistency test 7. Additional weight 700g [EN480-2] 8. Conical penetration probe 8mm dia x 50mm complete with 100g calibrated weight for gypsum testing to EN13279. 9. Water thermostatic unit with tank, pump, close loop 1^{o}C accuracy temperature control system with approx. 2L capacity. 10. Final Set Needle to EN196-3: 1.13mm diameter to EN/BS 11. Consistency Plunger – Vicat 12. Glass base plate. 13. Spare base plate and container for in-water testing.
	Standard Vicat Apparatus (with all accessories)	01	Standard Vicat apparats for setting time & consistency of cement/ mortar/gypsum for the standards BS4550, EN196-3, ASTM C191, C187or equivalent.Complete with EN 196-3 accessories including Mould, Initial Set Needle to EN196-31.13mm diameter to EN/BS and mould, Initial Set Needle to ASTM C187, C191 1mm diameter to ASTM and mould, Plastic mould conforming to EN, 10mm Consistency Plunger, supporting plate, thermometer, Cylindrical probe for consistency test, Additional weight 700g [EN480-2], Conical penetration probe 8mm dia x 50mm complete with 100g calibrated weight for gypsum testing to EN13279, Final Set Needle to EN196-3: 1.13mm diameter to EN/BS
	Reactivity of Lime-test apparatus	01	Apparatus for measuring reactivity of Lime with approx. 1000ml capacity. With digital thermometer, temperature probe, serial cable & software.
	Bulk Density of lime apparatus	01	Apparatus t measure bulk Density of lime by fall of sample apparatus. With 1000mL capacity, hopper & spring loaded yoke.
	Grout/mortar flow through apparatus	01	Apparatus for Grout/mortar flow through workability with spirit level, graduated rule and feet.
9	**Motorized flow table**	01	Motorised flow table to determine the consistency of mortar & lime. **Standards:** ASTM C230 **Features:** Complete with digital counter, flow mould, hopper, tamper and Brass flow caliper conforming to ASTM-BS standards.
10	**Air entrainment meter for mortar**	01	Air entrainment/content meter for mortar **Standards:** EN 459-2, EN 413-2, EN 1015-7 **Features:** 1 litre capacity approx. to determine the air content in cement mortar, cement paste, and lime mortar. Cast aluminium make. built-in hand pump. Filling ring included.
11	**Mortar mixer complete with stainless steel beater**	01	Mortar mixer complete with stainless steel beater **Standards:** EN196/1, EN 196/3 and EN 480/. **Features:** Equipped with automatic sand dispenser for periodic sand filling. Complete with stainless steel bowl and beater conforming to EN Standards. Table mounted unit. Alphanumeric display and key board control. Standard speeds/user defined speeds adjustable during mixing. Continuously variable speed (VFD technology). 3-points bowl supporting system. Revolving action - 140 or 285rpm, Planetary speeds: 62 and 125 rpm or user defined, Bowl capacity: 5 litres. **Accessories:**Open-type hopper, Hard rubber scraper, Reference sand, 32 bags, 1350 g each, total 43.2 kg, Stainless steel mixing bowl, Stainless steel beater& whisk for admixtures conforming to EN 196-1
12	**Mortar jolting apparatus**	01	Mortar jolting apparatus with digital counter **Standards:** EN 196-1, EN ISO 679 **Features:** To compact the 40x40x160 mm cement prisms in the mould, verification of compliance to standards: weight distribution, dimensions etc., Rigid structure, High resolution graphical display 128x80 pixels and 6 keys membrane keyboard, double test procedure, Rapid mould lock and release system, Drop height: 15 mm. **Accessories:** Feed hopper, Pair of scrapers to EN 196-1, Glass plate 210 x 185 x 6 mm
13	**Vibrating machine**	01	Vibrating machine for 70.7 mm cube mould. **Standards:** BS 4550 **Features:** For preparation and compaction of 70.7 mm mortar cube specimens. Mouldtable to be mounted on four springs attached to an eccentric shaft. Sample vibrations @ 12000 cycles per minute. Electric motor: 375 W approx. 70.7 mm cube mould included

14	**Cement curing cabinet, water cooler and air compressor (complete system)**	01	**Cement curing cabinet** **Standards:** ASTM C109, ASTM C511, EN 196-8, EN 196-1, EN ISO 679 **Features:** Strong chemical resistant structure, stainless steel racks, Humidity from 95% to saturation by water nebulizers, Connectable to water refrigerator, front doors fitted with transparent glass, The temperature maintained to 20±1°C by immersion heater. **Water cooler refrigerator**: approx. 800W, Comprising a refrigeration compressor, silent and CFC free, water reservoir with cooling coil, electronic thermos-regulator with digital display, sound proof metal case. Output water temperature range: +2 to +25°C, **included** Plastic pan 220x220x70mm approx. for water curing of three 40x40x160 mm cement specimens. **Heavy duty air compressor:** 10 bar, 200 litres, 230V, 50Hz, 1ph.
17	**Water bath**		Water bath with 2 channels thermoregulatory (heating/cooling), submersed recirculating pump and cooler unit. 230V/50-60Hz/1ph. **Standards:** EN 12697-34, ASTM D1559, D5581, AASHTO T245, EN 12697-12, EN 12697-23, ASTM D6927. **Features:Automatically maintaining of temperature, Two channels electronic thermos-regulator: heating/cooling with digital display, Complete with recirculating unit, Incorporating refrigeration compressor, Ideal for conditioning Asphalt specimens for Marshall and Indirect tensile tests, Ideal for cement specimens cure in water.**Polished stainless steel Internal surfaces with a sheet steel insulated outer case. Complete with re-circulating unit for temperature uniformity. Capacity: 40 L approx. Temperature range: +5 to +60°C approx. Accuracy: ± 1% approx. Inside dimensions: 550x360x200 mm approx.
18	**Automatic compression machine(15/600 kN)** **For cement, mortar & resins etc.**	01	Automatic compression machine, 15/600kN capacity for testing cement, mortar, resin, hydraulically bound mixtures and other materials. **Standards:EN 196/1, BS 3892, ASTM C109,EN/ISO 679.** **Features:** Class-1 Range: 1.5-15kN & 60-600kN. For compression tests on (1) 40.1 x 40 x 160mm prisms, (2) 40mm, 50mm, 70mm, 100 mm and 2 inch cubes, (3)cores with a maximum height of 180mm & for flexural tests on 40.1 x 40 x 160mm prisms using suitable accessories. use in compression & flexural tests, Fully automatic 4 channel hydraulic control unit, Capacitive touch screen, min 4GB built-in data storage, USB port. 4 channels control unit for attachment of 4 different frames with a single hydraulic power pack, High precision readability for sensors like LVDT, strain gauge, load cell and pressure transducers. Capacitive large touch screen. Internet modem connectivity through LAN cable. Closed loop PID and open loop control. Printer attach ability. Compression platens 165mm diameter x 30mm thickness approx. High accuracy LOAD CELL, Piston travel 50mm approx. Limit switch preventing piston overtravel. Load measurement accuracy: class 1 to EN 12390-4. Class A to ASTM E74 starting from 10% of full. **Accessories:** **Compression device:** Compression device to test portions of 40 x 40 x 160 mm mortar prism broken in flexure.Standards: EN 196-1, ASTM C349, NF P15-451, EN/ISO 679. **Compression device:** Compression device to test 50 mm (2") mortar cubes, high stiffness model.Standards: ASTM C109 **Flexure testing device:** EN Flexure testing device for 40x40x160 mm mortar specimens for EN 196 **Flexure testing device:** ASTM Flexure testing device for 40x40x160 mm mortar specimens
			Total Estimated cost = 11.80 Millions PKR

Note:

1. **All items must be of USA, Japan, Germany, UK, France, Italy, Spain, Belgium, Netherland, Finland, Switzerland & Sweden's manufacturer.**
2. **Quoted hardware must be compatible with lab power supplies and other equipment as per requirement.**
3. **Equipment shall be delivered with all necessary supplies and accessories required for installations and start-up.**
4. **The vendor shall demonstrate and document upon installation that the system meats all performance specifications.**
5. **Comprehensive documentation including Safety/Installation Guidelines and Operation/Experiment Manuals should accompany the product, both in Hard and Soft/CD/eBook formats FOR ALL ITEMS.**
6. **All items (1-18) of this lab will be technically & financially evaluated as a group. But the bidders are still required to quote individual prices of the items**

Tender-E: Concrete Material Laboratory

Sr.	Items	Qty	Specifications
1	**Forced convection laboratory oven**	02	Forced convection laboratory oven **Features:** Temperature control and display with digital thermo regulator/indicator. 250L cap. Approx. with safety thermostat. Min two extractable grid shelves. Walls made from zinc coated steel isolated with mineral wool. Front door made from stainless steel. Exhaust holes for fast cooling. (With an extra Dial Thermometer, high quality, Korea made 0 to 300°C.)
2	**Flakiness & Elongation Gauges**	01 Each	**Elongation/length Gauge:** to determine elongation index of aggregate, Made of wooden base, brass plate & steel pins. Standards: BS 812:105 **Flakiness/thickness Gauge:** to determine flakiness of aggregate, Made from heavy gauge steel. Standards: BS 812:105
3	**Flakiness sieves test set**	01 Set	Flakiness sieves test set to determine flakiness of aggregate particles. Heavy gauge steel sieves set including: 4.9x30, 7.2x40, 10.2x50, 14.4x60, 19.7x80, 26.3x90, and 33.9x100 mm slot sieves. Standards: BS 812:105.1
4	**Set of aggregate grids**	01 Set	Set of aggregate grids **Standards:** EN 933-3 **Features:** To determine the flakiness index of aggregates. Aluminum frame and steel bars. Set of 14 aggregate grids. Opening mm: 2.50, 3.15, 4.00, 5.00, 6.30, 8.00, 10.00, 12.50, 16.00, 20.0, 25.00, 31.50, 40.0, 50mm.
5	**Aggregate shape gauge**	01	**Required features in the experimental setup:**Aggregate shape gauge **Standards:** EN 933-4 **Features:** to determine the shape factor of the aggregates, complete with carrying case & traceable calibration certificate.
6	**Specific gravity frame with accessories**	01	Specific gravity frame **Standards:** BS 812:2, EN 12390-7, ASTM C127, AASHTO T85 **Features:** for specific gravity determination of fresh and hardened concrete and aggregates. With frame to support the balance. **Accessories:** Cradle for holding specimens, Specific gravity tank 400x400x330 mm, **Density baskets: (**200 mm dia. x 200 mm high, stainless steel with 3.35 mm mesh opening), (250 mm dia. x 250 mm high, stainless steel with 3.35 mm mesh opening) & (160 mm dia. x 180 mm high, stainless steel with mesh opening lower than 3 mm, to NF P18-554)
7	**End-Over-End shaker**	01	End-Over-End shaker. **Standards:** BS 1377:2 **Features:** for determining the particle density of soils by the Gas Jar method. **With** Gas jar 1 liter capacity complete with rubber bung.
8	**Standard aggregate crushing value apparatus**	02	Standard aggregate crushing value apparatus **Standards:** BS 812:110 **Features:** To provide relative measure of the resistance of an aggregate to crushing under a gradually applied compressive load. 150mm and 75 mm dia approx. Complete with cylinder, plunger, base plate, tamping rod and measure. Cylinder, plunger and base plate to be made from special alloy steel, hardened to 650 HV (57,8 HRC), and protected against corrosion.
9	**Impact testing machine**	01	Impact testing machine **Standards:** BS 812-112, NF P18-574 **Features:** to determine the aggregate impact value (AIV), made from steel protected against corrosion. With counter, two cylindrical measures (to BS and NF) and tamping rod.
10	**Los Angeles Abrasion Machine with accessories**	02	Digital automatic Los Angeles Abrasion Machine with accessories **Standards:** EN 1097-2, ASTM C131, EN 12697-17, EN 12697-43 **Features:** for testing coarse aggregates for resistance to abrasion. High stiffness welded steel frame, High resolution graphical display. With automatic counter, abrasive charge and noise reduction/CE compliant safety cabinet with door opening switch. With Set of 12 abrasive charges conforming to ASTM/AASHTO standards, Set of 12 abrasive charges conforming to EN standards.
11	**Air entrainment meter**	01	Air entrainment meter, pressure gauge type, 7Ll cap. Consisting of a flanged cylindrical vessel , complete with cover assembly incorporating a pressure gauge, air pump and valves and Filling ring.
12	**Vibrating table**	01	Vibrating table 1250x625 mm complete with 2 vibrating units. **Standards:** EN 12390-2 **Features:** 3000 vibrations per minute approx. Retaining edges. With Clamping device 3 & 8 kg and Water roof paddle switch.

13	**Electric poker vibrator**	01	Electric poker vibrator, dia. 25x250 mm, flexible shaft 2000 mm long. Mains operated 230 V, 50-60 Hz, 1 ph. For the internal compaction of concrete specimens both in laboratory and in site.
14	**Universal vibrating plate**	01	Universal vibrating plate, 12 V, Light and portable, operated by the car lighter. Suitable for vibrating plastic mould up to 150 mm and cylinder moulds up to dia. 160x320 mm. complete with elastic cord to fit the mould on the vibrating plate. Voltage: 12 V DC for connection to the vehicle cigar lighter or to a standard 12 V battery, Permanent magnet motor 12 V, 3000 rpm, 30 W.
15	**Specimen curing tank, Large**	01	Specimen curing tank, 1000 L cap. galvanized Zinc plated steel, complete with metal base specimen supporting grid. Accessories: Thermostatic digital submersible heating system for curing tank approx 1500 W, Metal cover for curing tank, Single upper rack, Submersible circulator pump.
16	**Buoyancy Balance**	01	Buoyancy Balance 15kg x 1g. Along with frame, tank and cradle
17	**Concrete test hammer**	01	Digital rebound concrete test hammer **Standards:** EN 12504-2, ASTM C805 **Features:** Aluminum body, Impact energy: 2.207 Nm (approx.), Measuring range: from 10 to 130 N/mm^2 (approx.), High-contrast graphic display, USB port and PC software. Complete with calibration anvil made from special alloy steel & carrying case.
18	**Crack microscope 40x**	02	Crack microscope 40x **Features:** high quality microscope for measuring crack widths in concrete members, masonry walls and other structures. Adjustable lamp unit with focusing knob. Eyepiece scale 360° turnable, Magnification: 40x, Measuring range: 4 mm approx., Battery operated.
19	**Ultrasonic pulse velocity tester**	01	Ultrasonic pulse velocity tester battery operated **Standards:** EN 12504-4, ASTM C597 **Features:** For the nondestructive evaluation of concrete homogeneity and determination of Dynamic Elastic Modulus. Microprocessor incorporated. Complete with two 54 kHz transducers, calibration rod, 250 mm of coupling agent, instruction manual and carrying case. Battery operated & with Large size digital display. RS 232 output for PC or printer. Connectable to oscilloscope. Variable Transit time. Selectable pulse rate. Frequency range 24 to 150 kHz.
20	**Resonance frequency meter.**	01	Resonance frequency meter. Suitable for longitudinal, torsional and flexural frequency of concrete and natural stone samples. Battery operated with battery charger. LCD 7" Touch screen integrated monitor, Integrated PC card, Software utility for positioning of measuring and impact points, Automatic measurement of resonance frequencies values, Display of harmonic frequencies, Storage of data on USB memory, Lab software included. Specimen supporting bench for resonance frequency meter. Compatible with prisms and cylinders. Maximum specimen height/dia. 160 mm.
21	**Pullout test apparatus, 100 kN cap.**	01	Pullout test apparatus, 100 kN cap. for pre-embedded inserts. For determining the pullout strength of hardened concrete in test specimens or structures by measuring the force required to pull an embedded metal insert and the attached concrete fragment from a concrete mass. Comprising a hydraulic jack 100 kN cap., a precision measuring Bourdon gauge 150 mm dia., bearing ring and 10 pullout inserts, all contained in a carrying case. For embedded inserts after the concrete hardening, with kit including a professional electrical drill with suitable power, SDS mandrel, 18mm drill bit for concrete, pack of 10 expanding plugs dia. 18mm x 80mm and manual air pump for dust cleaning. With test inserts suitable for installation after concrete hardening, Pullout inserts, 30 mm dia. Pack of 50 pieces.
22	**Pull-Off/Bond strength digital tester. 16 kN cap.**	01	Pull-Off/Bond strength digital tester. 16 kN cap. Battery operated. Complete with AC adapter, High resolution digital display unit, Graphic indication of applied load rate, Serial port for PC connection, complete with traceable calibration certificate, Drill bit with centering point to obtain 50 mm, 20mm dia. test surface, Metal ring (dinking die), 50 mm int. dia, 25 mm high for fresh plaster to EN 1015-12, Aluminium square plate 50 mm x 50 mm to EN 1348, Aluminium test disc 50 mm, 20mm dia. x 20 mm thick,Stainless steel test disc 50 mm dia. x 20 mm thick to EN 1015-12,Adhesive, bicomponent: 2x15 ml binder and 2x15 ml hardener (4 vials),Serial cable for PC connection.

23	**MICROCORE Apparatus**	01	MICROCORE, complete set for microcore test with mechanical parts and electric drill. 230 V, 50 Hz, 1 ph For the non destructive evaluation of concrete and masonry strength, taking 28 mm dia. cores and then adequately prepared for the compression test. For assessing the carbonation depth (with the appropriate reagents) and for masonry products to verify their physical condition or to evaluate the compressive strength related to the direction of sampling. with Electric drill, Flanged guide assembly,Two clamping pliers to fit the flanged guide assembly to the surface, Diamond core bit 28 mm int. dia., 100 mm long, Diamond core bit 28 mm int.dia.. 200 mm long, Set of accessories comprising 20 anchors, washers and drill bit, Two carrying cases, With Pressure water reservoir, 15 l cap.
24	**Deep scanning metal locator**	01	Deep scanning metal locator: Scans through solid concrete, Pinpoints the location and depth of target, Differentiates between steel rebar and copper pipe, Eliminates guesswork, needless holes, broken drills and saw blades, Essential tool for concrete contractors, remodelers, plumbers and electricians.
25	**Surface dampness tester**	01	Surface dampness tester: for surveying and investigation of moisture in buildings. Two operation modes: search and measure, distinguish sub-surface from surface moisture, complete with: 127 mm insulated deep wall probes, Moisture probe, Calcheck WME mode calibration check, 2 spare pins, Pouch and instructions,Wood species calibration table.
26	**Swing-arm deflectometer**	01	Swing-arm deflectometer with set of three 30x0.01 mm dial gauges. Used for determining the deflection of bridges, ceilings or any suspended structure. Comprising: swing arm with clamp for total orientation in any position qty 3; wire coil 20 m qty 3; dial gauges 30x0.01 mm qty 3; plumb weight qty 3; carrying case.
27	**Mechanical Strain Guage**	01	Mechanical strain gauge for the measurement of length variation. Measuring base 300 mm x 5 mm range. Digital gauge, 0.001 mm resolution, output for PC connection output for PC. For determining the length changes for use on concrete structures and steel. includinges the extensometer with digital gauge resolution 0.001 mm, standard bar, calibration bar, 50 datum discs, adhesive compound for datum discs and carrying case. With Carrying case
28	**Digital top loading balance**	02	Digital top loading electronic balance including rechargeable battery. Capacity 100kg. Resolution 5g
29	**Digital top loading balance**	01	Digital top loading electronic balance including rechargeable battery. Capacity 60kg. Resolution 1g
30	**Digital top loading balance**	01	Digital top loading electronic balance including rechargeable battery. Capacity 30kg. Resolution 1g
31	**Digital top loading balance**	01	Digital top loading electronic balance including rechargeable battery. Capacity 16kg. Resolution 0.1g
32	**Digital top loading balance**	01	Digital top loading electronic balance including rechargeable battery. Capacity 15kg. Resolution 0.2g
33	**Digital top loading balance**	01	Digital top loading electronic balance including rechargeable battery. Capacity 6kg. Resolution 0.1g
34	**Electric Motorized Aggregate Shaker**	01	Electric Motorized Aggregate Shaker c/w eight trays for Coarse Aggregate and Pan Tray
35	**Water permeability apparatus**	01	Water impermeability apparatus- Three place model. To determine the depth of penetration of water under pressure in the concrete specimens by clamping the specimen. Consisting a robust steel frame with clamping system, incorporating the hydraulic circuit, valves, gauge to check the water pressure and measuring transparent burettes mounted on top of the apparatus. Cube or prismatic specimens up to 200 mm side and cylinders up to 300 mm height. Complete with gaskets for 150 mm cube specimens, Set of three rubber gaskets for 200 mm cube or prisms, Accessory for permeability meter series.

36	**Specimen grinding machine**	01	Specimen grinding machine: to grind and polish concrete specimens, natural stones, ceramic materials, etc. Automatic version with radial displacement fully automatic and controlled by travel limit switches. Large base table for grinding contemporaneously up to three 100 mm cubes, or three 150 mm cubes, or two 200 mm cubes and concrete/tile blocks of various sizes, For cylinders up to dia. 160x320 mm, Motorized radial displacement in both directions by pushbutton or totally automatic, Complete with clamping elements for cubes, Suitable for dry grinding procedure. Approx Table dimension: 775x280 mm, Grinding wheel dia: 330 mm, Grinding wheel speed: 1400 r.p.m. **Accessories:** Set of 10 diamond impregnated sectors, Accessory to connect an aspirator for drying grinding procedure with Aspirator, Clamping device for concrete cylinders from dia. 100x200 mm to 160x320 mm, Device for clamping one additional cylindrical specimen from 100 up to 160mm dia., Clamping device for concrete cylinders from 50 to 100 mm dia., Device for clamping one additional cylindrical specimen from 50 up to 100 mm dia., Clamping device, vice mounted, for concrete cylinders from dia. 100x200 mm to dia. 160x320 mm, Spare set of 10 abrasive sectors, Core face preparation jig. (For preparation of parallel and flat core faces using horizontal surface grinders Consisting of a 4 place locking device capable of clamping core samples from 20 to 55 mm dia)
37	**Vebe consistometer**	01	Vebe' consistometer conforming to ASTM C1176, To measure the consistency of stiff to extremely dry concrete, measured by the time required for a given mass of concrete to be consolidated by vibrating in a cylindrically shaped mould. Completee with Slinding weight 20lb (9kg) and mould fixing plate.
38	**Universal core drilling machine**	01	Heavy duty universal core drilling machine, three speeds motor. 230 V, 50-60 Hz, 1 ph, Full 360° operation for coring at any angle, Main column extendable in height up to 3850 mm, Robust and stable unit, Rack feed (drilling excursion) 1000 mm long, 3 working speeds. Complete with: Extension rod 228 mm long, Strap wrench for fitting and removal of core bits, Thin wall diamond bits with bronze welded sectors having Bit length 400 mm approx. of sizes 50,75,100,150,200mm dia.
39	**Compression frame for testing cylinders & cubes 5000kN**	01	Compression frame for testing cylinders and cubes. (complete with suitable control unit) **Standards:** EN 12390-4. **Features:** 5000 kN capacity compression frame for testing cylinders up to 250 x 500 mm and cubes up to 300mm. High stiffness 4-welded columns frame. Heavy duty spherical seat. Limit switch preventing piston over travel. Complete with front door and rear transparent guard. Complete with traceable calibration certificate for load measurement accuracy and traceable test certificate for load transfer verification. Complete with connection kit for separate control console including pressure transducer. Compression platens 305mm x 305mm (approx.). Daylights: horizontal 425mm, vertical 520mm (approx.). Piston travel 50mm (approx.). Load measurement accuracy: class 1 to EN 12390-4 / class A to ASTM E74. Complete with traceable calibration certificate for load measurement accuracy and traceable test certificate for load transfer verification. Complete with control console and its connection kit including pressure transducer. Features of control console: semi-automatic control console. Hydraulic power system and digital readout unit with touch screen display. Test execution conforming to EN 12390, ASTM C39, C496, C78, and AASHTO T22. Accuracy: Class 1 (EN), Class A (ASTM). Dual stage pump. Data storage on USB (included), LAN Ethernet port for PC connection.
40	**Electronic universal compresometer /extensometer**	01	Electronic universal compressometer-extensometer for cylinders, prisms and cubes. For axial deformation measurement, modulus of elasticity, uniaxial secant elastic modulus. Complete with distance piece for small specimens, template for gauge length and pair of elastic bands to hold the meter to the specimen. High sensitivity: 0.02 micron, Suitable for various sample size: cylinders up to dia. 160x320mm, cubes up to 200 mm, prisms 40x40x160 mm etc.
41	**Strain gauges**	02	Strain gauges of flowing specs: 9.53 mm gauge length Pack of 5, 20 mm gauge length Pack of 10, 30 mm gauge length Pack of 10, 60 mm gauge length Pack of 10. Accessories: Connecting terminals 50 pairs sheet, Strain gauge application kit including: Conditioner, Neutralizer, Acetone, two Tweezers, Adhesive and Catalyst agent, 100 m of Bipolar cable, Solder, electric Welder and carrying case., Compensation device for up to 4 Wheatsone bridges with ¼ or ½ bridge setup.
42	**Portable vacuum pump**	02	Portable vacuum pump, free air displacement 75 l/min, ultimate vacuum 0.1 mbar. 230 V, 50-60 Hz, 1 ph
43	**Digital vernier calipers**	10	High quality Digital vernier calipers made in stainless steel. 0-300mm, reading 0.01 mm, accuracy ± 0.01 mm, repeatability 0.01 mm.

44	**General purpose toolkit**	05	Approx 200 piece general purpose hardware toolkit consisting various sizes of Precision Screwdrivers, Bits, Ratchet Handle, Tape measure, Claw hammer, Adjustable wrench, Long nose pliers, Diagonal Pliers, Hex keys, assorted Screws, Wall Plugs, Wire Stripper, Torpedo level, Knife etc.
45	**Universal flexure frame-200kN**	01	200 kN capacity high rigidity flexural frame with Parallel and orthogonal testing mode, complete with load cell and connection kit for separate control console. High rigidity (200 kN/mm), especially suitable for testing FRC and sprayed concrete, For testing beams, flagstones, slabs. Max span between lower rollers: 1m, Load measurement by load cell or pressure transducer, Piston return by counterweights, Piston travel limit switch included **Accessories:** • Upper and lower roller assembly for centre and third point test of concrete beams up to 200mm height, conforming to EN 12390-5 and ASTM C78, C1609, C1018, EN 14488-3, EN 14651. • Set of one upper and two lower roller assembly for testing paving flags, conforming to EN 1339 • Swivel jointed loading pad for testing kerbs, conforming to EN 1340. To be used with support bearers. • Upper loading bearers to perform the third point and centre point flexure test to EN 12390-5, including two rollers 210 mm long, 40 mm diameter. To be used with support bearers. • Auxiliary testing frame for the measurement of deflection of FRC beams to EN 14488-3, 14651, ASTM C1609. Accessory for testing sprayed concrete slab to EN 14488-5. Including supporting square base and spherically seated loading element. Complete with displacement transducers. • Set of lower platen and upper platen spherically seated, 165 mm dia., for compression tests on small and low strength specimens. • Displacement transducer with 50mm travel for reading displacement of sprayed concrete slab centre under concentrated load. • 100mm displacement transducer for measuring the piston travel. Complete with attachments. • Distance piece 50mm thickness for flexure frame • Distance piece 80mm thickness for flexure frame
46	**Particle Size and Shape, Sieve Analysis**	01 Set	Sieve set for particle size and shape analysis **Features:** Full depth testing sieves, Frames made of sheet steel, wire cloth sieves manufactured from stainless steel, Perforated plates made from tinned steel. Complete with sieve brush, Pan and cover 200 mm & 300 mm dia. **Range of 200mm dia sieves:** ISO (BS) sieves (20µm, 45µm 75µm, 150 µm, 212 µm, 300 µm, 425 µm, 600 µm, 850 µm, 1.18mm, 1.7mm, 2.36mm, 3.35mm, 6.3mm, 10mm, 20mm, 40mm,75mm,125mm). **Range of 300mm dia sieves:**ISO(UNI,NF,DIN) sieves (5.0mm, 6.3mm, 10mm), ISO(BS,NF,DIN) sieve 14mm, ISO(NF,DIN) sieve 20mm, ISO sieve 37.5mm, ISO(NF,DIN) sieves(50mm, 63mm, 75mm). **Range of 300mm dia sieves (perforated metal plate):** (4mm, 7.1mm, 20mm, 25mm, 50mm, 125mm).

Local items

Sr.	Items	Qty	Specifications
47		3	Beam Mould Size 150mm x 150mm x 750mm
48		1	Electric Motorized Mixer for 1/2 bag concrete
49		24	Cube Mould (Cast Iron) Size 6" x 6" x 6"
50		1	Compacting Factor Apparatus
51		1	Large caring Tank of size 3 feet x 2.5 feet x 5 feet. With thermostatically controlled electric heater.
52		01 each	Galvanized Sample Trays 48" x 44" x 4", 24" x 24" x 3", 24" x 24" x 3", 18" x 18" x 3", 12" x 12" x 2"
53		12	Cube Mould (Cast Iron) Size 4" x 4" x 4"

54		2	Sample Splitters complete with tray (38mm sampling), (50mm sampling)
55		25 L	Mould Oil
56		1	Bulk Density Measure 1L, 2L, 5 L and 10 Liters
57		6	Transportation / storage container Approx. 20 Liters
58		1	Slump Cone with base plate and funnel
59		5	Aluminum Scoop Large Size
60		10Kg	Large Polythene Bag Approximately 1m x 450mm (Per kg)
61		2	Compacting Bar
62		1	Sand Absorption Cone & Tamper
63		3	Sample Container Approximately 2.5 Liters
64		1	Regent Bottle 1000ml Capacity
65		1	Glass Thermometer for Concrete Range 0 to 200°C
66		2	Glass Beaker 600ml
67		1	Tamping Rod 16mm dia x 600mm long Hemispherical at both ends
68		1	Measuring Cylinder 500ml, 100ml
69		1	Bulb Pipette 50ml Capacity
70		2	Wash Bottle Polythene 500ml
71		1	Steel Float
72		1	Measuring Cylinder 100ml
73		1	Soft Headed Mallet
74		1	Volumetric Flask 1000ml with stopper
75		1	Wire Brush
			Total Estimated cost = 15.1 Millions PKR

Note:

1. **All items must be of USA, Japan, Germany, UK, France, Italy, Spain, Belgium, Netherland, Finland, Switzerland & Sweden's manufacturer.**
2. **Quoted hardware must be compatible with lab power supplies and other equipment as per requirement.**
3. **Equipment shall be delivered with all necessary supplies and accessories required for installations and start-up.**
4. **The vendor shall demonstrate and document upon installation that the system meats all performance specifications.**
5. **Comprehensive documentation including Safety/Installation Guidelines and Operation/Experiment Manuals should accompany the product, both in Hard and Soft/CD/eBook formats FOR ALL ITEMS.**
6. **Items (1-46) of this lab will be technically & financially evaluated as a group. But the bidders are still required to quote individual prices of the items.**
7. **Items (47-75) of the local its lab will be technically & financially evaluated as a group. But the bidders are still required to quote individual prices of the items.**

GENERAL TERMS & CONDITIONS

1. Only the sole & certified Dealers/Distributors of the Manufacturers (from the countries of manufacturing as mentioned separately in each tender document) are eligible. Eligible Bidder/Tenderer is a Bidder/Tenderer who has authorization of the Principal/Manufacturer/Dealer duly verified by the embassies concerned necessarily accompanied with PEC acierated list of Engineer having training conducted from the Manufacturer. Failure to provide such certificate in the Technical Proposal will make a Bidder/Tenderer liable to be rejected.

2. The Bidders shall compulsorily produce a certificate from the Manufacturer/Principal that it will continue to support the terms and conditions accepted by the Bidder and will comply with these terms and conditions in any circumstances. Failure to produce such certificate from the Manufacturer/Principal will make the Bidder liable to be rejected.

3. The Bidder shall have at least five (05) years of work experience regarding the relevant field in Pakistan for successful delivery and commissioning of such equipment duly supported by the relevant documents in this regard.

4. Prices should be quoted on C&F basis and safe delivery and successful commissioning of the equipment at the University College of Engineering & Technology, The Islamia University of Bahawalpur shall be the responsibility of the contractor. If the items supplied are not according to the required specification/make it will have to be replaced by the firms on their own cost.

5. Payment will be made through **Deferred Letter of Credit (Deferred L/C)** which will be opened by the Islamia University of Bahawalpur and the exemption letters will be issued to the successful selected bidders accordingly. After signing agreement with the successful bidder, the IUB will release 80% of the payment within 15 days from the date of acceptance of the equipment at IUB site after successful inspection of all the equipment in all respects. Rest of the 20% payment will be released after proper commissioning and testing of the equipment at site. The sole agent and successful Bidder will be responsible for all kinds of charges (customs clearance, freight, insurance, loading, unloading etc.) and any other expenditure regarding extension or amendment of L/C etc till the successful delivery of items at site.

6. Agreement on stamp paper @ 0.25 percent of total cost should be submitted by the firm.

7. If the acceptance letter of a tender issued during the validity period of the tender is not accepted by the Bidder or the Bidder remains unable to comply with the supply order, the bid security shall be forfeited. Furthermore the bid security shall be forfeited in the following cases.

   a) In case the offer is withdrawn, amended or revised during the validity period of the tender.

   b) In case the Bidder fails to execute the order strictly in accordance with the terms and conditions laid down in the order.

8. The successful Tenderer/the Contractor against each Item(s) shall furnish a Performance Security as under:

   a) Within **twenty (20) days** of the receipt of the Acceptance Letter from the Purchaser, in the form of Bank Guarantee from the Principal / Demand Draft / Pay Order / Call Deposit Receipt, in the name of the Treasurer, The Islamia University of Bahawalpur, issued by a Scheduled Bank operating in Pakistan, for a sum equivalent to **10%** of the contract value denominated in Pak Rupees.
   b) The Performance Security shall be confiscated, on occurrence of any / all of the following conditions and it will be retained for the initial period of warranty (03 Years):-
      i. If the Contractor commits a default under the Contract;
      ii. If the Contractor fails to fulfill the obligations under the Contract;
      iii. If the Contractor violates any of the terms and conditions of the Contract.
      iv. If the Contractor remains unable to comply with the terms and conditions of the contract as mentioned in the Tender Document.

9. Technical Proposal shall compulsorily comprise the following, **without quoting the price**:

a) Technical Proposal Form.
b) 02% Bid Security of the Estimated cost as mentioned in the Tender.
c) Covering letter duly signed and stamped by authorized representative.
d) Authorized Certificate / document from the Principal / Manufacturer duly verified by the embassies concerned necessarily accompanied with PEC acierated list of Engineers, having training conducted from the Principal/Manufacturer. Failure to provide such certificate will make the Bidder liable to be rejected.

e) The Bidders shall compulsorily produce a certificate from the Manufacturer/Principal that it will continue to support the terms and conditions accepted by the Bidder and will comply with these terms and conditions in any circumstances. Failure to produce such certificate from the Manufacturer/Principal will make the Bidder liable to be rejected.

f) The Bidder shall attach the relevant evidence of having at least five (05) years of work experience regarding the relevant field in Pakistan for successful delivery and commissioning of such equipment duly supported by the relevant documents in this regard.

g) Technical Brochures / Literature
h) Technical proposal shall be submitted in ring binding to ensure the safelty and security of all the documents submitted by the Bidder.
i) The Tenderer shall also enclose soft copies of the Technical Proposal, including all Forms, Annexes, Schedules, Charts, Drawings, Documents, Brochures, Literature, etc., in the form of MS Word Documents, MS Excel Worksheets and Scanned images, with the hard copies.

10. Where a reference is made to any specifications or national or international standard, equal or higher quality will be acceptable. In case your offer conforms to the standards other than quoted in the tender document, you are required to submit the required evidence of equivalence by the recognized forum and a copy of each of the standard.

11. Delivery period shall be 90 days from the date of opening of L/C against the order.

12. The Contractor shall furnish the user documentation, the operation manuals, and training manuals for each appropriate unit of the supplied items and other information pertaining to the performance of the items, in hard copy format and in soft copy format.

13. The bidder shall ensure the warranty, after sale service and supply of the spare parts must be guaranteed. All the supplies must be covered comprehensively for after sale & service both labor and parts for the period of warranty of 03 years after the issuance of Taking-over Certificate in respect of items or any portion thereof as the case may be.

14. Any clarification may be sought from the contractors and the Bidders may be asked to give the presentation of their product.

15. Warranty Requirements are as under;

a) The Contractor shall warrant to the Purchaser that the equipments supplied by the Contractor, under the Contract are genuine, brand new, non- refurbished, un-altered in any way. The component(s) of any item(s) found dead on arrival /defective shall be replaced with new item(s) or component(s) by the contractor as such and shall in no way be referred to the warranty.
b) The Contractor shall provide Manufacturer's warranty of parts and workmanship for minimum period of three (03) years after the issuance of Taking-over Certificate in respect of the items or any portion thereof, as the case may be, which will include: Free on site repair / replacement of defective / damaged parts, labor and transportation expense of any kind, within four weeks of intimation.

c) The Contractor shall clearly mention the Terms and Conditions of service agreements for the items supplied after the expiry of initial warranty period of three 03 years.

16. The taking-over certificates will be issued after the supply of the items (including installation, configuration, deployment, commissioning, testing, and training of the delivered items).

17. Validity of rate should be for 120 days from the date of opening of tenders.

18. The vendors will be responsible for any damages during Transit/Delivery. They will also be responsible for any accident and their consequent damages.

19. The Contractor shall arrange and undertake a comprehensive training program for the staff nominated by the Principal UCET, to ensure that they shall acquire a good working knowledge of the operation, and general maintenance of the equipments to be supplied under the Contract.

20. The pre-shipment inspection visit of at least two personnel nominated by the Principal Engineering college, Islamia University Bahawalpur and / or the inspection of the Equipment Principals/Proprietor at the premises, if desired by The Islamia University of Bahawalpur shall be arranged by the Supplier / Contractor at his / her own cost. The responsibility for the quality, quantity, correctness and adherence to the Specifications etc. of the Equipment shall lie solely and squarely on the Supplier / Contractor.

Signature: _____

Name: _____

Designation: _____

Date: _____

ATTACHMENTS:

Bid Money with the Technical Proposal (02% of the Estimated Cost).	(Yes / No)
Affidavit for Non-Black listing.	(Yes / No)
Bid Validity Certificate.	(Yes / No)
Duly Signed terms & conditions.	(Yes / No)
All the other documents mentioned in the Tender Document.	(Yes / No)
All the other documents mentioned in the General Terms & Conditions.	(Yes / No)

NOTE: Bid shall be signed by the bidder/authorized person for bidder.