Category: Mech-1 (Laboratory Apparatuses)

1. Cam and Follower Apparatus

Setup consisting of stainless steel camshaft driven by a variable speed motor with a provision of mounting at least three sets of hardened alloy steel cams (Tangent, Eccentric, and Circular Arc) and hardened alloy steel followers (Roller, Knife edge, and Mushroom). The spring loaded follower must be properly guided in gunmetal bushes and it must be possible to easily change the type of follower according to the cam under test and to load the follower by weights. There must be provision for measurement of: (i) follower displacement, (ii) angle of rotation of cam shaft, (iii) rpm of cam by non-contact digital rpm meter mounted in control panel.

The setup must be capable of performing the following experiments: (i) To plot the Follower displacement Vs Angle of rotation curves for different cam follower pairs, (ii) to observe the follower bounce using a digital stroboscope, (iii) to study the effect of follower weight and spring compression on bounce.
The setup must be mounted on a rigid frame and be complete with all electricals, instrumentation, and manual.

2. Universal Vibration Apparatus

The apparatus must consist of a frame on which various elements (to be supplied along with the apparatus) can be quickly arranged for performing the experiments on the following systems: Simple and compound pendulum; free vibrations of spring-mass system; torsional vibration of single/two rotors; forced vibration; etc. Kindly mention in detail the actual number, nature and nature of experiments that can be performed in the system quoted by you

The complete unit must be powder coated. The unit must be self-contained and have arrangement for measurement of different quantities involved, exciter, strip chart recorder and to safely store spares. A manual for performing different experiments must also be provided.

3. Temperature Control Trainer

Educational trainer for temperature control to study & demonstrate the following types of controls: open loop or manual control; proportional control; two mode (P+I) control; two mode (P+D) control; three mode (PID) control; tuning of controller (Open loop method) using Zeigler-Nichols method; and stability of the system using the BODE PLOT.
Temperature Transmitter : Input RTD PT-100 (0-100°C), output 4-20 mA.
Process tank : Material Stainless Steel, Capacity 0.5 lit
Heater : Nichrome Wire Heater, Capacity1 kW
Thyristor Controller : Input 4-20mA for heater.
Flow Measurement : Rotameter.
Interfacing unit : For input-output communication with auto/manual facility
Micro-processor Controller : PID Setting, auto tuning, fully programmable with serial communication
Software : For experimentation, PID control, Data logging, trend plot, offline analysis and printing.

Features: Digital Indicating Controller with digital displays. Whole unit must be mounted rigidly on a base plate. The metal parts must be powder coated. The set-up must be completely computer controlled and have a facility to interface the system with computer which enables to change the PID parameters using computer. Real time data acquisition must be possible by interfacing the set-up with computer using software.

4. Strain Gauge Trainer Kit

A trainer kit to conduct experiments on measurement of strains on cantilever beam using resistance strain gauges with provision for loading the beam with weights. The instrument must be self contained with inbuilt power supply for self and also for the strain gauge excitation, strain gauge signal conditioner & amplifier, and 3 ½ digit analog to digital Converter; front panel strain gauge Bridge balancing with the help of potentiometer.
Display: 3 ½ digit seven segment led display.
Resolution: 1 micro strain; Excitation: 10-12 V DC
Complete with all cables, weights, strain gauges, etc. and manual.

5. LVDT Trainer Kit

The LVDT Trainer setup must consist of a micrometer jig fitted on the base plate to give displacement to the core of a LVDT. The sensor will be connected to the instrument with patch chord. Completely self contained system with inbuilt power supply, signal conditioner, amplifier, Analog to Digital converter, and display unit with front panel bridge balancing through potentiometer adjustment and knobs in the front panel for Zero and calibration. The instrument must be calibrated to read the displacement directly in mm. Alongwith Technical/ user manual, Standard accessories and connecting wires.

Detailed Specifications:
Sensor Type: Linear Variable differential transformer ± 10 mm displacement
Range : ± 10.0/ 25.0 mm; Excitation voltage : 1-4 kHz at 1-2V rms; Linearity : 1%; Connection : through 6 core shielded cable of atleast 2 m length
Displacement indicator
Display : 3 ½ digit seven segment red led display of range 200mv for full scale deflection to read ±1999 counts.
Excitation voltage : 5000 Hz at 1 V rms
Zero adjustment : front panel through potentiometer; Calibration : front panel through potentiometer.
Sensitivity : 0.1mm; System inaccuracy : 1%; Repeatability : 1%
Connection : through 6 core shielded cable with DIN connector.

6. Temperature Trainer Kit

The System must comprise of a small water kettle as a temperature source up to 100°C with Thermocouple, RTD and Thermistor to sense the temperature. Self contained setup with digital Indicator of 3 ½ digit is supplied along with the sensor to indicate the temperature in degree centigrade. Source temperature measured by a glass thermometer to read up to 110 °C. Alongwith Technical/ user manual, standard accessories and connecting wires.

Detailed Specifications:
Sensor types (housed in 6 mm diameter SS tube of suitable length):
Thermocouple - Fe-K (J type), R. T. D. - PT-100, Thermistor – 5 kΩ (-ve coefficient).

7. Piezo-Electric Trainer

The setup must be designed in such a way that it helps in understanding working of Piezo-electric material. Self contained setup with all test points brought outside to enable the student to understand the working of the instrument properly. Complete with Technical/ user manual, standard accessories and connecting wires.
Detailed Specifications:
Piezo-Electric Transducer
Charge Sensitivity pc/g : 35 – 45; Voltage Sensitivity mV/g : 28 – 30; Capacitance pf : 1000
Frequency range Hz : 10 – 3000; Shock max. g's : 1000
Indicator
Input impedance : 6000 M Ohms; Max. Input signal : 800 pc; Dynamic force : Max. 1kg.
Display : 31/2 Digit LED display.
Power Supply : 230V 50Hz

8. Speed Measurement Trainer

The setup must comprise of a small variable speed motor rigidly fixed on a strong metal stand. The motor runs by 12V DC supply. There must be provision to measure and display the speed by two sensors: Magnetic pickup speed sensor and photo reflective sensor. Complete self contained system with power supply, standard accessories, connecting wires, and Technical/ user manual.
Detailed Specifications:
Max. Motor Speed : 1500 RPM (approx.)
Sensor : Non- Contact Magnetic Pickup & Opto-coupler IC
Display : Digital Seven segment Red LED display to read upto 9999 counts.

9. Vibration Measurement Trainer

The setup must comprise of vibration generator, accelerometer to measure vibration and vibration indicator with in-built frequency generator & power amplifier. The vibration generator must supply sinusoidal signal. The measurement of displacement, velocity and acceleration must be selectable. The setup must be completely self contained with power supply, standard accessories, connecting wires, and Technical/ user manual.

Detailed Specifications:
Vibration Generator
Capacity : 5N (Max); Displacement : 1 mm (p-p).
Mounting : M5 standard taped Hole to mount the specimen.
Power Amplifier & Vibration Indicator
Frequency : 50 to 1000 Hz variable by potentiometer ;Amplitude : 0-10V (p-p) variable by potentiometer
Wave form : Sinusoidal; Display : 3 ½ digits LED.
Selection Mode
Acceleration : 0.1- 199.9 m/s^2.

Velocity : 0.01- 19.99 cm/s.
Displacement : 0.001 - 1.999 mm (p-p).

Accelerometer (Vibration Sensor)

Frequency Range : 10 to 2000 Hz; Input Impedance : > 10,000 M Ohms; Charge Sensitivity : 45 pC/g to 55 pC/g.
Capacitance : 1000 pF.
Type of Connection : 1 M Length Teflon Single core shielded cable; Mounting Thread : M5 Tap hole.

10. **Cut section model of centrifugal pump**

Cut section model of centrifugal pump mounted on a sturdy wooden base.

Category: Mech-2 (Metrology Instruments)

1. Digital Vernier Caliper

Size: 0-200 mm (8")
Accuracy: ±0.02mm (excluding quantizing error); Resolution: 0.01mm; Repeatability: 0.01mm;
Display: LCD; Scale type: ABSOLUTE electromagnetic linear encoder
Max. response speed: Unlimited
Battery: Solar battery
Dust/Water protection level: IP65 or above
Alarm: Counting value composition error
Functions: Origin-set, inch/mm conversion
SPC cable with data switch

2. Digital Micrometer

Accuracy: ±1µm (excluding quantizing error); Resolution: 0.001mm, .00005"/0.001mm
Flatness: 0.3µm; Parallelism: 1µm; Measuring faces: Carbide tipped
Display: LCD
Length standard: Electromagnetic rotary sensor
Battery life: Approx. 3 years under normal use
Dust/Water protection level: IP65 or above
Functions: Origin-set, Preset (over 100mm models); Zero-setting, Automatic power ON/OFF, Data hold, Data output, inch/mm conversion (inch/mm models)
Alarm: Low voltage, Counting value composition error

3. Portable Surface Roughness Tester

The battery operated surface roughness tester must meet or exceed the following specifications:
Measuring range: X-axis: 12 mm; Z-Axis (detector): 350 µm; Resolution: 0.02 µm;
Measuring speed: 0.25 mm/s (1 mm/s returning)
Measuring Force/ Stylus tip: 0.75/4 mN 2/5 µm R
Applicable standards: JIS'82 / JIS'94 / JIS'01 / ISO '97 / ANSI / VDA
Assessed profiles: Primary profile / Roughness profile / DF profile / Roughness profile-Motif
Evaluation parameters: Ra, Rc, Ry, Rz, Rq, Rt, Rmax, Rp, Rv, R3z, Rsk, Rku, Rc, RPc, Rsm, Rz1max, S, HSC, RzJIS, Rppi, RΔa, RΔq, Rlr, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Vo, Rpm, tp, Htp, R, Rx, AR, etc. with possibility to customize
Analysis graphs: Bearing area curve /Amplitude distribution curve
Filters: Gaussian , 2CR75 , PC75
Cut off length: 2.5, Blum
Variable sampling lengths
External I/O: USB, Digimatic Output, Printer Output, RS-232C
Storage of measurement condition at power OFF with minimum internal memory storage of 10 sets of measurement conditions and 11 sets of measured profiles. Provision for storage of upto 500 measurement conditions, 10000 measured profiles, 500 display images, Text file (Measurement conditions / Measured profile /Assessed profile / Bearing area curve / Amplitude distribution curve)
Printing functions: Measurement conditions / Calculation results / Calculation results for each sampling length / Assessed profile / Bearing area curve / Amplitude distribution curve / Environment setting infomation
Calculation result display: LCD display of calculated results/ parameters. The calculated & displayed parameters must be selectable/customizable.
Small hole measuring detector, nose pieces for flat and cylindrical surfaces. Various adapters/accessories required for complementing the tester must be mentioned separately, if these are not part of standard supply.

Complete with connecting cables, carrying case, roughness specimens, calibration stage, AC adapter, operation manuals, printer, etc.

Category: Mech-3 (Raw Materials)

S. No.	Item	Specifications	Unit	Rate (Rs.) per unit
1.	MS Rod	12 mm (½")	Kg.	
		15 mm (5/8")		
		32 mm		
2.	MS Flat	50 mm × 10 mm	Kg.	
		38 mm × 6 mm		
		38 mm × 3 mm		
3.	MS Angle	25 × 25 × 3 mm	Kg.	
		32 × 32 × 3 mm		
		38 × 38 × 6 mm		
		50x50x6 mm		
4.	GI Sheet	8'×3' / 8'×4', 26 SWG	Sft.	
5.	GI Pipe 'B' class Surya/Prakash Make	½"	Ft.	
		1"		