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Dynamic of Machine Lab

Mechanical Engineering Lab Equipment

HOLDING TORQUE APPARATUS (EPICYCLIC-GEAR-TRAIN)

The unit consists of an epicyclic gear train. Gear train consist of an internal gear having 56 teeth two planet gears with 21 teeth each and sun gear having 14 teeth. The train is driven by a 3-pH/1-pH, 1440 R.P.M. motor giving maximum input torque of 0.5 kg. The planet carrier carries the planet gears. The internal gear is mounted over a flange which rotates in bearings. A pulley is mounted over a output shaft of internal gear. Torque measurement arrangement with spring balance is provided for both the internal gear and planet carrier, so that either or then can be held stationary and holding torque required for stationary member and output torque for the other member can be measured. The whole unit is mounted over a sturdy frame. Motor current is calibrated for output torque of the motor. A three channel R.P.M. indicator (digital) can be supplied with the unit at an extra cost which enables to determine the angular velocities of all the members. A digital torque indicator for motor output torque can be supplied at an extra cost, instead of motor current calibration.

Service Required:

- ✓ Floor space of about 1.5 m. X 2 m.
- ✓ 220 V., 1-pH, A.C. supply.

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MOTORIZED GYROSCOPIC APPARATUS

The unit's of a motorized gyroscope consist of a disc rotor mounted on a horizontal shaft rotating in the ball bearing of one frame. The rotor shaft is coupled to a motor mounted on a trunnion frame having bearings in the yoke frame which is free to rotate about vertical axis. Thus a disc can be rotated about three perpendicular axes. Angular scale and a pointer fitted to frame help to measure precision rate.

Features:

- ✓ Demonstrates relationship between applied torque and the rate and direction of rotation and precision.
- ✓ Gyroscopic couple easily varied by an assortment of weights.
- ✓ Precisely balanced rotor.
- ✓ Completely portable and suitable for classroom demonstration.
- ✓ Useful to verify the relationship.

Range of Experiments:

- ✓ Observation of gyroscopic behavior (two laws and stability).
- ✓ Experimental justification of the equation T=IWWP for calculating the gyroscopic couple by observation and measurement of results for independent variations in applied couple (T) and precision (WP).

Specifications:

- ✓ Disc rotor-30 cm dia.10 m.m. Thick.
- ✓ Drive-A.C./D.C. single phase motor.
- ✓ Overall size-30 cm dia. base, 50 cm. height.
- ✓ Weight-30 Kg approx.

Service Required:

- ✓ A.C. 220 v 50 Hz supply.
- ✓ Tachometer for speed measurement.
- ✓ Suitable bench area to mount the instrument.

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UNIVERSAL GOVERNOR APPARATUS

The unit consists of a main spindle driven by variable speed motor. Spindle can be fitted with four different governor assemblies. A scale with pointer is provided. We can calculate each characteristics of each governor at different speed and compare the performance.

Specifications:

- ✓ Drive unit-D.C.motor 0-1500 R.P. M.

Range Of Experiments:

- ✓ Watt, porter, Hartnell and Proell Governor.
- ✓ Determination of characteristics and comparison with theoretically predicate controlling force curves.
- ✓ Porter and Proell Governors
- ✓ The effect of varying the mass of the center sleeve.
- ✓ Proell Governors
- ✓ The effects of varying the rotating mass.
- ✓ Hartnell Governor
- ✓ The effects of varying the following parameter.
- ✓ Initial spring compression.

Service Required :

- ✓ 230 V, 5 A. A. C. supply with earthing connection.
- ✓ Suitable bench area for mounting the instruments.

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Dynamic of Machine Lab

Mechanical Engineering Lab Equipment

STATIC & DYNAMIC BALANCING APPARATUS

The unit consists of a precision ground shaft rotating freely in ball bearing. For static balancing demonstration, an eccentric weight creates unbalance and value of relative weight require to balance the eccentric weight statically is determined. For dynamic balancing apparatus four weight assembly mounted on shaft is provided. Longitudinal and Angular position of weights are calculated from respective relative weight and the weight are mounted at the position. The rotation is vibration free when rotated by small motor.

Specifications:

- ✓ Drive motor frictional horse power.
- ✓ Four balance weight each containing a different sized "Eccentric" for varying the unbalance.
- ✓ Additionally the containers, quality of precision made steel loading balls are supplied.

Features:

- ✓ Independent analysis of static and dynamic balancing.
- ✓ Adjustable balance weights with variable moments.
- ✓ Balance weight position accurately measured both radially and longitudinally.
- ✓ Machine can be suspended on chains for dynamic balancing.
- ✓ Completely portable and suitable for classroom demonstrations.

Range Of Experiments:

- ✓ Using the four weights provided Static balancing of the system using a moment polygon construction.
- ✓ Dynamic balancing of the above system by calculating the position of the weights along the shafts, by resolving and taking moments about one end of the shaft.

Service Required:

- ✓ An A.C. electrical supply for the motor 220/240 V.
- ✓ Suitable floor space for instrument.

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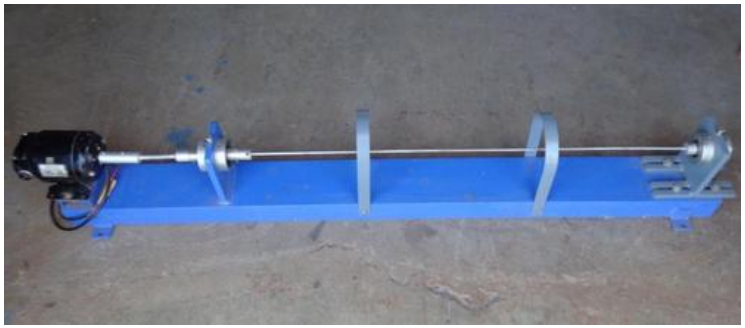
Dynamic of Machine Lab

Mechanical Engineering Lab Equipment

WHIRLING & SHAFT

The unit consists of a base upon which bearing holders and driving motor are coupled. Bearing holder is provided for fitting various bearing to provide different conditions for test shafts, viz. both end fixed and one end free. A variac provided for speed control of driving motor. The unit demonstrates the phenomenon of whirling of shaft. After the test shaft can not be used, hence unit only demonstrate the principle.



Specification:

- ✓ Shafts made from steel and of the following nominal dimensions.
- ✓ Diameter mm. (inch) Length mm. (inch).
- ✓ 4.5 or (3/16) 900 or (36).
- ✓ 6 or (1/4) 900 or (36).
- ✓ 7.5 or (5/16) 900 or (36).
- ✓ One kinematic coupling and bearing for fixed or free ends without resistance .
- ✓ An electric motor: Universal, 5000 rev/min. frictional horse power.
- ✓ A dimmer stat for controlling speed of motor.

Range of Experiments:

- ✓ Display of the various models of the range of shafts.
- ✓ Both end Directionally free.
- ✓ One end fixed and other free.
- ✓ Models of vibration can be studied and the frequency can be measured each case.

Services Required:

- ✓ Suitable floor space area to mount the instrument.
- ✓ 230 V., 15 A. A. C. electric supply with earthing connection.
- ✓ Tachometer to measure the speed.

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CAM ANALYSIS APPARATUS

The unit consists of a cam profile and study of cam follower system. The instrument consists of cam mounted shaft supported by ball bearing upon which three different type of cam can be mounted. The push rod for follower is supported vertically which can adopt three different type of followers can be changed easily. Motor rotates the cam and dial gauge is provided for plotting of follower displacement W.R.T. cam position. Cam jump speed can be found by operating different speed and effect of speed and spring force on jump speed can also be studied.

Specification:

- ✓ Cam Eccentric, tangent, circular.
- ✓ Follower Knife edge, roller type & mushroom type.
- ✓ Variable speed motor coupled to cam shaft of suitable range and various speeds.
- ✓ A dial gauge.
- ✓ The unit is mounted on sturdy base.

Range Of Experiments:

- ✓ Plotting and analysis of the X-0 curve.
- ✓ The velocities and accelerations of the follower may be derived and hence inertia forces plotted over the whole lift period. The condition of follower bounce can clearly be shown
- ✓ by carrying out theoretical calculations & graph from X-0 curve
- ✓ Test can be repeated by changing parameters like various compression springs,
- ✓ Follower weights and cam speed.
- ✓ To study the effect of follower weights (W) on the speed of bounce.
- ✓ To study the effect of initial spring compression (S) on the peed of bounce.

Service Required:

- ✓ 230 V A.C supply.
- ✓ Bench area of 0.5 m x 1 m at working.

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Dynamic of Machine Lab

Mechanical Engineering Lab Equipment

UNIVERSAL VIBRATION APPARATUS

The Designed The Vibration Apparatus Lab For Conducting Various Experiments To Illustrate And Verify The Principles And Relations Involved In Study Of Vibrations.

Description:

This Apparatus Enables A Comprehensive Arrangement Of Vibration Experiments To Be Conducted On A Single Sturdy M. S. Channel (100 mm X 50 mm) Basic Frame. The Experiments Are Specially Designed For Quick And Easy Assembly On The Frame. Many Components Are Common To Several Experiments And The Whole Frame Is Powder Coated.

Range Of Experiments:

- ✓ Pendulum Experiments
- ✓ For Pendulum Experiments A Sub-Frame Is Attached To The Upper Beam Of The Frame. This Pendulum Supported Frame Is Provided With Hardened V Guide For Supporting The Compound Pendulum. It Also Carries Two Small Chucks For Gripping The Wires For The Bi-Filer Suspension And Simple Pendulum. Following Experiments Can Be Conducted.

Expt. No. 1 Simple Pendulum:

- ✓ To Verify The Relation T= 2 S L/G & To Plot The Graph T2 V/S L

Expt. No. 2 Compound Pendulum:

- ✓ To Verify The Relation T= 2 S K + (OG)/g(OG)
- ✓ To Determine The Radius Of Gyration & Equivalent Length Of Compound Pendulum.

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Expt. No. 3 Bi-Filar Suspension- (Tensional Oscillations):

- ✓ To Determine The Radius Of Gyration Of Body About The Center Of Gravity By Using Relation.
- ✓ T= 2 K/Asl/ G
- ✓ Longitudinal Vibrations-
- ✓ Expt. No. 4 Spring Mass System
- ✓ To Verify The Relation
- ✓ T= 2 Sw/ Km .g And Plot The Graph T2 Vs W.
- ✓ Expt. No. 5 Equivalent Spring Mass System.
- ✓ Study Of Undamped Natural Vibrations Of Beam Pivoted At One End
- ✓ Supported By Tension Spring At The Other End.
- ✓ Expt. No. 6 Equivalent Spring Mass System.
- ✓ Study Of Undamped Natural Vibrations Of Beam Pivoted At One End Supported By Tension Spring At The Other End, Plot The Of Graph Amplitude Vs Frequency.

Torsional Vibrations:

- ✓ Expt. No. 7 Single Rotor.
- ✓ To Varify The Relation
- ✓ T=2S I/Kt
- ✓ And To Study The Relationship Between The Periodic Time & Shaft Length.

Expt. No. 8 Two Rotors

- ✓ To Verify The Relation T=2 Sia + Ib/Kt (Ia+Ib)
- ✓ And Plot A Graph Of F Vs 1/ I 1
- ✓ Expt. No. 9 Single Rotor With Viscous Damping.
- ✓ To Find Out The Damping Coefficient 'Ct' For Various Depth Of Damping Drum (immersed In Liquid) & To Plot A Graph Of Damping Torque Vs Depth Of Damping Drum.

Expt. No. 10 To Find Out The Natural Frequency Of Beam With & Without Load & To Verify The Dunker Ley's Rule.

Expt. No. 11 To Study The Forced Vibrations For Various Amount Of Damping & To Plot A Graph Of Amplitude Vs Frequency.

Accessories:

- ✓ Exciter Unit With Fractional H. P. Electric Motor.
- ✓ Ordinary Strip Chart Recorder For Recording Vibrations.
- ✓ Damper With Arrangement For Changing Damping.

Service Required:

- ✓ 230 V, 15 A. A. C. Electric Supply With Earthing Connection.
- ✓ Floor Space Area Of About 2 m. X 2 m.

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JOURNAL BEARING APPARATUS

The Unit Consists Of A Plain Steel Shaft Encased In Bearing & Directly Driven By A Small Electric Motor. The Bearing Is Freely Supported On The Shaft & Sealed At The Motor End.

The Motor Speed Is Precisely Controlled And Adjusted By Specially Designed Control Unit And Can Be Run In Both The Direction.

The Bearing Contains Twelve Equispaced Pressure Tappings Around Its Circumference And Four Additional Once Along Its Top Side And On A Vertical Radial Plane. All Are Connected By Light And Flexible Plastic Tubes To The Rare Manometer Panel, So That Pressure Head Of Oil At All Sixteen Points Can Be Clearly Observed At All Times.

Oil Is Supplied To A Low Pressure Region At Both Ends Of The Bearing By An Adjustable Reservoir Fitted At The Side Of The Rare Panel.

The Bearing Can Be Loaded By Attaching Various Weights To The Arms Supported Beneath It.

A Table Is Conveniently Provided At The Front Of The Apparatus.

Specifications:

- ✓ Journal Dia.-50 M.M. Dia.
- ✓ Bearing Dia.-55 M.M. Dia.
- ✓ Weights-4 Adjustable Weights.
- ✓ Recommended Oil-Sae 10
- ✓ Motor-D.C. Shunt Wound, Speed Range 500-3000 Rev./min.
- ✓ Control Unit-Special Design.
- ✓ Manometer Panel-16 Tubes Mounted On Wooden Backboard.

Features:

- ✓ Pressure Profiles Along And Around The Bearing Continuously Monitored On Large Manometer Panel.
- ✓ Theoretical Pressure Profiles Can Be Carried Out & compared With Practical Result.

- ✓ Wide Range Of Speeds & Loads Possible.
- ✓ Ideal For Group Studies & Demonstrations.
- ✓ A.C. Single Phase F.H.P. Motor Is Used With A Speed Control Unit.
- ✓ Manometer Height Of 2-3 m. Provided To Study Bearing Pressure Variation At Higher Speeds.

Range Of Experiments:

Simple Demonstrations:

- ✓ Observation Of The Pressure Profile At The Various Conditions Of Load & Speed.

Experimental Investigations:

- ✓ After Noting The Pressure Profile For Any Chosen Condition, The theoretical sommerfeld Curves May Be Plotted

Service Required:

- ✓ A.C. Single Phase, 230 V, 50 Hz Electrical Supply.

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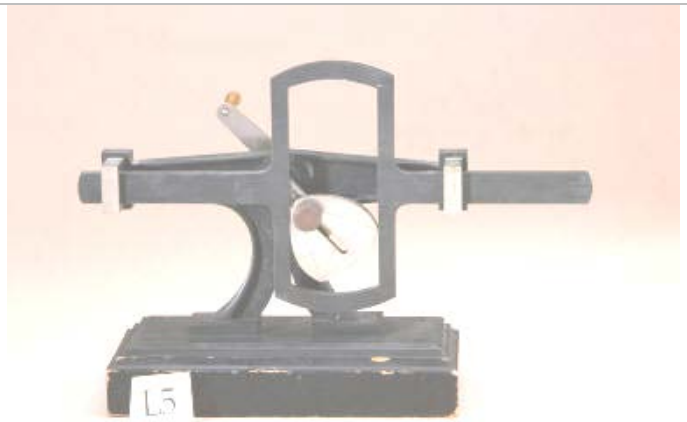
Dynamic of Machine Lab

Mechanical Engineering Lab Equipment

KINEMATIC PAIRS

Kinematic Pairs From The Basic Elements Of Machine, The Board Helps Students To Understand The Concepts Of Pairs. It Consists Of Following Types Of Pairs Mounted On A Board.

Sliding Pair., Cylinder Pair, Sliding-Turning Pair, Helical Pair, Spherical Pair Cam-Follower Unclosed Pair, Friction Discs (Line Contact, I. E. Higher Pair)



Inversion Of Four Bar Chain:

- ✓ In The Unit The Following Inversion Are Mounted On A Board
- ✓ Crank And Lever Mechanism.
- ✓ Double Lever Mechanism.
- ✓ Pantograph (Double Lever Mechanism.)

The Inversion Are Made Of Transparent Sheet And Fitted With Chrome Plated And Fastenings.

Inversion Of Slender Crank Chain:

- ✓ Following Inversion Are Of The Chain Are Fitted On A Board.
- ✓ Internal Combustion Engine Mechanism.
- ✓ Oscillating Cylinder Engine Mechanism
- ✓ Crak And Slotted Lever Mechanism
- ✓ Hand Pumps Mechanism.

Inversion Of Double Slider Crank Mechanism

- ✓ The Inversions Made Out Of Transparent Links Mounted On A Board
- ✓ Elliptical Trammel.
- ✓ Scotch Yoke Mechanism.
- ✓ Slotted Plate And Slider Mechanism.

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CORIOLLIS COMPONENT ACCELERATOR

It Is Designed To Study coriolis Component Of Acceleration Of A slender Crank Mechanism. Here The Mechanical slender System Is Replaced By A Continuous Stream Of Water Flowing Through A Steadily Rotating Pair Of Tubes. These Tubes Can Be Rotated At Various Speeds By Using A Swinging Field Motor Which Also Acts As Dynamometer. A Perplex Window On Top Of Tank Gives Clear View Of The Process & Prevents Splashing Of The Water Over The Side Of The Tank. The Dynamometer Continuously Measures Torque Applied To The Rotating Tubes. The Equipment Is Self Contained. Water Recirculating, Provided With Its Own Speed Control Unit And Separate Water Circulation Pump.

Specifications:

- ✓ Main Tank-Fabricated Out Of Fibre Glass Plastic Sheet.
- ✓ Rotating Arms-9 mm/6 mm Orifice Dia. 300 mm Long
- ✓ Rotameter-300 To 3000 L.P.H
- ✓ Electric Motor-D. C. Swinging Field, 0.5 Hp, 50 Rpm
- ✓ Monoblock Pump-Single Phase, Pump With Motor 2400 L.P.H Discharge
- ✓ Rigid Support Structures.

Control Consisting Of:

- ✓ Pump Switch
- ✓ various Speed Control
- ✓ Speed Indicator
- ✓ Main Switch

Range Of Experimentation:

Coriolis Component Of Acceleration Can Be Determined At Various Speeds Of Rotation And Water Flow Rates.

Service Required:

- ✓ Single Phase, A. C. Electric Supply 230 V, A.C. 50 Hz.
- ✓ Floor Space-1.5 m. X 1.5 m.

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ROPE BRAKE DYNAMOMETER

Features:

- ✓ Rope Brake Dynamometer Consists Of A Drum Mounted On A Fabricated Frame
- ✓ Driven With The Help Of Electric Motor. Rope Is Wound Around The Dynamometer & With
- ✓ The Help Of Spring Balance & We Can Measure Load Applied.
- ✓ The System Can Be Manually Operated Without Motor.
- ✓ If It Is Motor Driven Maximum Load Applied Will Be 20 Kg.
- ✓ If It Is Manually Operated Maximum Load Applied Will Be 7.5 Kg.