**GENERAL INSTRUCTIONS**

(1) Sealed tenders are invited for the procurement of laboratory items of HBTI Kanpur. The tender documents can be bought from the Store Purchase Section, Harcourt Butler Technological Institute Kanpur. Interested tenderers may download the same from the website and submit their offer along with **Tender fee of `1000/- each** (In form of Crossed Demand Draft issued by any Nationalized Bank in favour of Director H.B.T.I., Kanpur). While submitting your offer mark Tender No. and due date on the envelope.

(2) Quotations received without Tender fee will not be considered.

(3) No request for the extension of the due Tender date will be considered.

(4) Each Tender consisted of various schedules and EMD for each schedule is mentioned separately. Tenderers may submit their proposals for **one or more schedules** along with the respective EMD (In form of Crossed Demand Draft issued by any Nationalized Bank in favour of Director H.B.T.I., Kanpur).

(5) The offer submitted for each schedule should be complete in all respect and price quoted for each schedule should be **FOR destination HBTI Kanpur**.

(6) Late/delayed offers will not be accepted.

(7) Tenders received before the deadline shall be opened in the presence of attending Tenderers/their authorized representatives on the same day at scheduled time and venue.

(8) Corrigendum, if issued any for the Tender, shall form part of the Tender document. Corrigendum will be posted only on HBTI Kanpur website (www.hbti.ac.in). Tenderes are requested to visit HBTI Kanpur website regularly and note the corrigendum/amendments to the tender without fail and submit the offer accordingly.

(9) All other terms and conditions are as per the Institute rule.

(9) The Director reserves the right to cancel any or all Tenders without assigning any reason.

**For HBTI Kanpur**

**Tender No.: 06 /SPS/CHE/2016 Dated: 14.03.2016 due on 04.04.2016 by 01:30 pm**

|  |  |  |  |
| --- | --- | --- | --- |
| **Schedule No.** | **Name of Equipment with Specification** | **Quantity** | **EMD (`)** |
| Computer Application & Design Lab |
| 1. | Computers i7 processors  | 30 | 36000 |
| 2. | Software(i) ANSYS CFD Software (ii) DESIGN EXPERT Software(iii) HYSIS Software(iv) ASPEN PLUS(v) MATLAB(vi) Intel Fortran Complier with IMSL Library(vii) Origin 2015(viii) PDF Editor Adobe (ix) Material Studio 8.0 Software | 010101010101010101 | 34000 |
| Energy and Environment Lab. |
| 3. | (i) Rotary Viscometer(ii) Karl Fischer Titration Apparatus(iii) Cloud and pour point apparatus(iv) Copper strip corrosion test apparatus(v) Apparatus for foaming characteristics of lube oils(vi) Oxidation test for lube oils(vii) Constant temperature water bath(viii) Oil bath (ROUND) (Argond Welded(ix) Carbon Residue Conradson Apparatus (x) Rams Bottom Carbon Residue Apparatus(xi) Lubricity meter(xii) Aniline point(xiii) Redwood viscometers I & II(xiv) Abel flash point(xv) Pensky-Marten apparatus(xvi)Sulphated ash(xvii) UV Vis Spectrophotometer(xviii) Automatic digital refractometer | 010101010101010101010101010101010101 | 50000 |
| Mass Transfer Lab |
| 4. | (i) Adsorption Apparatus(ii) Gas Absorption Apparatus(iii) Diffusion in liquids and gases(iv) Continuous rectification(v) Liquid-liquid extraction(vi) Solid-liquid extraction | 010101010101 | 20000 |
| Heat Transfer Lab |
| 5. | (i) Heat Transfer by Conduction(ii) Heat Transfer in Fluidized Bed | 0101 | 4000 |
| Fluid Mechanics Lab |
| 6. | (i) Reynolds Experiment(ii) Bernoulli's Principle Apparatus | 0101 | 5500 |
| Mechanical Operation Lab |
| 7. | (i) Ball Mill Apparatus(ii) Rotap Sieve Shaker Apparatus | 0101 | 4500 |

**SPECIFICATIONS**

**Schedule No. 1**

Computer Application & Design Lab.

Computers i7 processors: Intel 3.5 GHz LGA 2011 i7 5930K Processor, 6 Cores, 64-bit Architecture, LGA 2011-v3 Socket Type, 3.5 GHz Clock Speed, 140 W Maximum Thermal Design Power (TDP), 22 nm Manufacturing Process, Desktop Processor

**Schedule No. 2**

Softwares:

(i) ANSYS CFD Software: ANSYS academic teaching CFD version 16.2-unlimited Nodes. Includes fluent and CFX. 5 users perpetual.

(ii) DESIGN EXPERT Software:

(iii) HYSIS Software:

(iv) ASPEN PLUS:

(v) MATLAB:

(vi) Intel Fortran Complier with IMSL Library:

 Intel Visual Fortran Composer Professional with IMSL for Windows Academic (ESD)

 -Intel Fortran Compiler

 -Intel Math Kernel Library

 -IMSL Fortran Numerical Library

(vii) Origin 2015: Origin 2015 on Windows Professional License Academic

(viii) PDF Editor Adobe: PDF Editor Adobe on Window Professional Version 11 License Academic

(ix) Material Studio 8.0 Software:

**Schedule No. 3**

Energy and Environment Lab.

(i) Rotary Viscometer: Determination of absolute viscosity from -300C to 400C

(ii) Karl Fischer Titration Apparatus:

 For determination of % moisture

 DIGITAL AUTO DISPENSING (Burette Less)

 Range: 0.1ml to 100.0 ml

 Peristaltic pump to deliver KF Reagent & volume reading on digital display. 25 micro Ltr Syringe

(iii) Cloud And Pour Point Apparatus:

 As per IP: 15, 219,

 ASTMD: 97, 2500, IS:1448(P-10) insulated body with Glass tubes

 Four Test

(iv) Copper Strip Corrosion Test Apparatus:

 As per IS:1448 (P-15), IP:154 & ASTMD:130/80.

 Only Bath for 6 Test 50 C & 100 C

 With digital temperature indicator cum controller having calibration certificate traceable to national standard

 (a) Range : -20 deg c to 102 deg c

 (b) Readability: 3 digits LCD

 (c) Resolution : 0.2 deg c

 Accessories:

 i) S.S. Bomb (As per IS: 1448 (P-15), IP:154 & ASTMD:130/80.) ii) Vice 6 Strip

 iii) Test Tube (6” x 1”)

 iv) Copper Strip as per IP: 154

 v) ASTM COPPER CORROSION COMPARATOR CHART

(v) Apparatus For Foaming Characteristics Of Lube Oils:

 As per IP:146, ASTMD: 892. (Single Bath Type) Rectangular Model but Having 2 Nos. diffusing stone 2 Nos. cylinders.

 With Volume Meter and Foam Test cylinder as per ASTM.

(vi) Oxidation Test For Lube Oils:

 As per IP:48 with rotameter type flow meter and

 4 Test Apparatus.

(vii) Constant Temperature Water Bath:

 Rectangular, double walled construction. Inner chamber made of stainless steel and outer body made of mild steel duly powder coated. Temperature range 5$℃$ above ambient to 99$℃$ above ambient to 99$℃$. Fitted with immersion type heater, digital temperature. Controller cum indicator accuracy $\pm 0.5℃$. Operating on 230V AC. fitted with circular pump with stirrer

(viii) Oil Bath (ROUND) (Argond Welded):

 Double walled outer M.S/S.S. & Inner S.S.304 argon welded supplied with thermostat. Temp.Range 50 ˚C to 300 ˚C ± 5 ˚C.

 Cap in Ltr : 10 Ltr, Size in inches: 12”x12”,Rating watts: 2000, Outer M.S

(ix) Carbon Residue Conradson Apparatus:

 ASTMD:189 & IP:13.Complete unit with Porcelain Crucible without Burner

 i) Single Test Unit.

 (x) Rams Bottom Carbon Residue Apparatus:

 As per IS:1448 (P-8) & ASTMD:524, with Pyrometer and Control with 6 Nos. Cocking bulbs and 1 No. Syringe but without tongs.

 i) Round Bath 14" dia x 10" Ht.with copper Coil voltage varrier and Digital Control but with Automatic Control (LED DISPLAY) Rectangular Bath

(xi) Lubricity Meter:

(xii) Aniline Point As per IS:1448 (P-3)

(xiii) Redwood Viscometers I & II As per IS:1448 (P-25)

(xiv) Abel Flash Point As per IS:1448 (P-20)

(xv) Pensky-Marten apparatus As per IS:1448 (P-21)

(xvi)Sulphated Ash As per IS:1448 (P-4)

(xvii) UV Vis Spectrophotometer:

 Wavelength range-190 to 1100nm;

 Spectral bandwidth-1nm (190 to 1100nm);

 Wavelength display-0.1-nm increments;

 Wavelength setting-0.1-nm increments (1-nm increments when setting scanning range );

 Wavelength accuracy-±0.1nm at 656.1nm D2 ±0.3nm (190 to 1100nm);

 Wavelength repeatability-±0.1nm;

 Stray light-less than 0.02% NaI at 220nm, NaNO2 at 340nm,

 less than 1.0% KCｌ at 198nm;

 Photometric system- Double Beam;

 Photometric range- Absorbance: -4 to 4 Abs
 Transmittance: 0% to 400%;

 Photometric accuarcy-±0.002 Abs (0.5Abs), ±0.004 Abs (1.0Abs),

 ±0.006 Abs (2.0Abs);

 Photometric repeatability-less than ±0.001 Abs (0.5Abs), less than ±0.001 Abs (1Abs), less than ±0.003 Abs (2.0Abs);

 Baseline stability-less than 0.0003 Abs/H at 700nm
 (one hour after light source turned ON);

 Baseline flatness-within ±0.0006 Abs (190 to 1100nm,one hour after light source turned ON)

 Noise level-Within 0.00005 Abs RMS value (at 700nm)

 Printers-DPU, ESC/P, PCL printers, USB I/F Windows-compliant printers are available with USB memory and PC software

 Memory-USB memory (option) Saved as text and UVPC file

 Performance for PC-USB memory＋UVProbe (standard) Win XP

(xviii) Automatic Digital Refractometer:

 Light Source-LED with 100000 hrs lamp life

 Refractive index measuring range: 1.3-1.7

 Measured accuracy: ±0.0001

 Temperature control mode: Built-in semiconductor

 Temperature control range: 15-250C

 Temperature Accuracy: ±0.10C

 Interface: RS232, USB, SD Card, U disk

 Data storage capacity: 1000 data files

 Display mode: 5.6 inches TFT, touch screen

 Power supply: 220VAC±10%, 50 Hz

**Schedule No. 4**

Mass Transfer Lab.

Adsorption Apparatus: -2 adsorbers with activated carbon filling

 -adsorber with 8 sampling point

 -safety adsorber for closed water circuit

 -continuous process

 -metering pump for concentrated adsorbate solution

 -pump for recirculating the treated water

 -water temperature control

 -digital temperature indication

 -flow rate adjustable

 -change of adsorbate concentration and contact time

Gas Absorption Apparatus: -separation of CO2/air mixture by absorption in counter

 flow with water

 -production of gas mixture using CO2 from compressed gas

 cylinder and ambient air

 -adjustment of mixing ratio using valves

 -compressor for delivering the gas mixture into the

 absorption column

 -DURAN glass absorption column (packed with rasching

 rings) and desorption column

 -continuous solvent regeneration in circuit with desorption

 column under vacuum

 -1 pump for desorption column and 1 pump for returning

 solvent to absorption column

 -water temperature control with heater and refrigeration

 system

Diffusion In Liquids And Gases: -investigation of diffusion in liquid and gases

 -transparent tank with magnetic stirrer, conductivity meter

 and U-tube with capillaries for investigating diffusion in

 aqueous solutions

 -evaporation of highly volatile solvent with a diffusion tube

 in a heated water bath for investigating diffusion in gases

 -removal of gaseous solvent at the upper end of the diffusion

 tube with a fan

 -heater with controller and sensor for adjusting the

 temperature in the water bath

 -height-adjustable microscope for monitoring and

 determining the solvent volume in the diffusion tube

 -separate display and control unit contains temperature

 controller and fan

Continuous Rectification: Continuous rectification with sieve plate column

 Electrically heated evaporator

 Tanks for feed , bottom and top product

 Feed preheating/bottom cooling

 top product condenser

 Adjustment of reflux ratio

 Measurement of Temperature, reflux ratio. heating power, column differential pressure, cooling water flow rate, system pressure

Liquid-Liquid Extraction: -liquid-liquid extraction in counter flow operation with

 distillation for enrichment of the extract

 -operation as continuous or discontinuous process using 2

 three-way valves

 -glass extraction column

 -distillation column and distillation bridge with liebig

 condenser

 -electrical bottom heating via PID controller

 -water jet pump for reduction of evaporation temperature

 during distillation

 -stainless steel tanks for feed, solvent, raffinate, extract and

 top product (distillation)

 -2 pumps to deliver the feed and solvent

 -2 valves for adjusting the phase boundary

 -distillation column packed with raching rings

Solid-Liquid Extraction: -revolving extractor for continuous and discontinuous solid-

 liquid extraction

 -switching to 1-, 2- or 3- stage modes possible by valves

 -extractor revolving speed adjustable by potentiometer

 -spiral conveyor with variable speed to adjust the extraction

 material feed rate

 -flow rate of solvent adjustable for each stage via speed of

 pumps

 -temperature of solvent adjustable for each stage by PID

 controller

 -tanks for extraction material, extraction residue, solvent

 and extract

**Schedule No. 5**

Heat Transfer Lab.

Heat Transfer by Conduction: -examination of heat conduction in solids

 -experimental set-up consisting of experimental unit and

 display and control unit

 -linear heat conduction: 3 measuring objects, heating and

 cooling element, 9 temperature measuring points

 -radial heat conduction : brass disc with heating and cooling

 element, 6 temperature measuring points

 -cooling with mains water

 -electric heating element

Heat Transfer in Fluidized Bed: -examination of the fluidized bed formation and the heat

 transfer in the fluidized bed

 -fluidized bed of compressed air and aluminium oxide,

 particle sizes either 125 $μm$ or 300$ μm$

 -glass reactor, backlit

 -glass reactor with sintered-metal plate at the inlet and air

 filter at the outlet

 -heating element, submersible and with adjustable power

 output

 -manual setting of the air flow rate via valve and flow meter

 -instrumentation: temperature sensors at heater, air inlet, in

 fluidized bed, pressure measurement upstream of the reactor

 and in the reactor (manometer, pressure sensor), flow meter

 for measuring the air flow rate, power output of the heating

 element

 -digital displays for temperatures, power output, pressure in

 the fluidized bed

 -steel rulers for measuring the immersion depth of the

 heating element and the height of the fluidized bed

 -safety valve, temperature switch at the heater, air filter at

 the outlet

**Schedule No. 6**

Fluid Mechanics Lab.

Reynolds Experiment: -visualisation 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

 -water supply using HM 150 base module or via laboratory

 supply

Bernoulli's Principle Apparatus: -learning bernoulli's principle

 -venturi nozzle with transparent front panel and measuring

 points for measuring the static pressures

 -axially movable pilot 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

 -flow rate determined by HM 150 base module

 -water supply using HM 150 base module or via laboratory

 supply

**Schedule No. 7**

Mechanical Operation Lab.

Ball Mill Apparatus: -comminution of solids with a ball mill

 -2 drums with steel jackets and transparent fronts, 1 steel

 drum with lifting bars

 -1 drive roller with adjustable speed, 1 loose roller

 -axle spacing of rollers adjustable to accommodate different

 drums

 -measurement of power consumption

Rotap Sieve Shaker Apparatus: -for material analysis 2" down through 20$μm$