College of Engineering Trivandrum, Thiruvananthapuram

P4/5998/18/CET 27.11.2018

NOTICE INVITING TENDER

Tender No.	:07/18/P4/ECE
Superscription	:Purchase of 1 No of MEMS specific software tool Conventorware - for MEMS lab in the ECE Department.
Last date and time of receipt of tender on the website (www.etenders.gov.in)	:18/12/2018 12 P.M
Date and time of opening of tender	:21/12/2018 3 P.M
Date upto which the rates are to be firm	:21/06/2019
Tender Cost	:₹3,186/-
EMD required	:18,000/-
Address of the officer to whom hardcopy is to be send.	:THE PRINCIPAL,COLLEGE OF ENGINEERING TRIVANDRUM, THIRUVANANTHAPURAM-695016, KERALA :GSTIN :32AAAGC0358L1ZP

Specifications are attached as Annexure.

General conditions

1. The unit price, all other charges such as delivery, transporting, packing, shipping, loading and unloading charges etc, and GST must be shown seperately and should be furnished unambiguously.
2. Payment : 100% after the successful supply, installation, and satisfactory performance.
3. Delivery Period: Maximam Delivery period will be 60 days from the date of receipt of supply order.
4. F.O.R : Electronics & Communication Engineering Department of this institution.
5. The period of warranty should be 12 months on-site.
6. Agreements as per NIT 2 in Rs.200/- Kerala Stamp Paper and tender form should be uploaded.
7. 5% security deposit along with agreement should be furnished within a month/fortnight from the date of receipt of supply order.
8. Date of opening of tender : In case the proposed date declared is holiday, the tender will be opened on the next working day.
9. Only GST registered firm can participate in the tender. GST number must be mentioned. The firm under composition scheme must mention the words "Composition taxable person" in their documents and should submit proof for that.
10. After E-Tendering the hard copy of the agreement should submit to the undersigned before the

date of opening of the tender.

NB: The Tender procedure will be made as per Rules mentioned in the Revised Store Purchase Manual.

The bidders should participate this tender through E-Tendering System. Tender cost and EMD should be submitted only through online. For more details Contact Ph. 0471 2577088, 0471 2577188, 0471 2577388,0471 2515760.

PRINCIPAL

CoventorWare Specifications
• **Software have FEM, BEM and System level simulation capabilities that can be able to simulate micro designs such as MEMS.**
• **Mechanical, Electrical, Process and Package libraries for MEMS design.**
• **MEMS Material Properties Database**
o Properties of the materials used in MEMS fabrication process.
o The properties associated with the materials include strength, density, conductivity, and thermal characteristics
o Editing of material properties as per the user requirements.
o Adding new materials to the database
o Material properties of recognized MEMS Foundries.
• **Process Editor**
o MEMS Fabrication foundry process steps
▪ process steps such as LPCVD, PECVD, Wet etch, Dry Etch, Anisotropic Wet Etch, DRIE, Thermal Oxidation, Sputtering, Evaporation, Ion Implantation, Anodic Glass wafer bonding, silicon fusion wafer bonding
▪ Recognized foundry processes such as DALSA_MK08I1, IMEPKU, MetalMUMPS, PolyMUMPS, SoiMUMPS, SiGeMEMS, SINTEF_MoveMEMS_PZT, and Tronics MEMSOI.
• **Layout Editor**
o 2D Layout drawing in scale of microns, nanometers and angstroms.
o Measurement rulers to measure the dimensions
o Create and edit 2D drawing with various options such as cell hierarchy, mirroring, instance the cells into arrays, Shortcut key bindings for drawing layout, and Boolean operations etc.
o Layout rule check.
o Import/Export 2D drawing standard formats such as .gds, .dxf etc.
• **Solid Model and Mesh Builder**
o Build 3D model from 2D Layout drawing and process steps.
o 3D model Viewer with partitioning capabilities.
o Capability to select and name the model boundaries such as layer, part, conductor, face, patch, edge, vertex etc.
o Option to measure the 3D model dimensions.
o Auto and custom mesh generation.
o Various meshes include Surface, Tetrahedrons, and Mapped, Manhattan, and Extruded bricks with different algorithms in linear and parabolic elements for faster and accurate simulation results.
o Mesh Refinement, biasing and mesh quality check.
o Cross Section View of 3D model.
o Import/Export 3D model standard formats such as .sat, .igs, .step etc.
• **MEMS Solvers/Modules for FEM/BEM Simulations:**
o **Electro Static** solver which can compute capacitance between conductors of the model with and without dielectrics. Compute forces on conductors and dielectrics for MEMS designs. Combine with the finite element structural mechanics analysis tool to analyze electrostatic actuation, including pull-in.
o **Electroquasistatic** computes both equivalent capacitance and conductance between perfect conductors in the presence of dielectric materials with slight conductivity (lossy dielectrics).
o Set voltage, charge, or surface qualifiers for structure component & supports fixed and movable

dielectrics.

- Parametric analysis of voltage, design dimensions and material properties.
- Symmetry design can be partitioned which helps to simulate part of a design instead of full design thereby saving computation time.
- Mesh convergence study for accuracy.
- Results capacitance and charge matrix results (electrostatics), charge and normal force results (force on conductors). Capacitance and conductance results (electroquasistatics).
- Result values and 2D plotting of Results.
- 3D results of the model showing Coordinates X, Y, Z, Charge Density, Electrostatic Pressure, Electric Field X, Electric Field Y, Electric Field Z, Electric Field Mag etc.
- **Mechanical** to compute mechanical deformation and stresses.
- **Thermal** analysis without a structural analysis. Also select this option to run a parametric and study of steady-state thermal analysis.
- **Thermomechanical** to calculate the temperature distribution resulting from specified temperature, convection-radiation, heat flux, and heat generation loads and boundary conditions.
- **Electrothermal** to calculate potential distribution, followed by the temperature changes resulting from Joule heating.
- **Electrothermomechanical** to compute potential distribution, followed by the temperature changes resulting from Joule heating, followed by the resultant stresses and displacement simulation is in a single pass.
- **Piezoelectric** to compute the stress that develops when deformation is prevented or restrained by surrounding materials and then assumes a linear coupling relationship between electrical displacement or electric field strength and the mechanical factors.
- **Modal** (non-equilibrium) analysis to compute the frequency modes of the model.
- Can also compute harmonic analysis, static analysis, transient analysis, contact analysis etc.
- Computing the effects of temperature on the model. Temperature analysis can be based on static thermal conditions or on convection flow
- Consider Non-Linearity sources such as material nonlinearity, boundary nonlinearity, and geometric nonlinearity.
- Include direct modal damping, Rayleigh damping, Thermoelastic/Modal Damping, and Squeezed-Film Damping in mechanical simulations.
- Coriolis Forces to simulate a Coriolis Effect.
- Including Circuit Elements in a Piezoelectric Harmonic Analysis
- Set boundary conditions like fixing and apply loads on patches, displacement, temperature, heatflux, convection-radiation, potential, symmetry plane, current density, pressure, Stress Gradient, Temperature fixed & initial, Heat Generation, Joule Heating, Material Damping,Angular Velocity, Joule Heating, ElectroForce, CompositeDamping ,Acceleration , AngularAcceleration, ConcentratedLoad, mass and stiffness Proportional Damping etc.
- Results include Displacement, stress, modes, mass, inertia, generalized_Disp, generalized_Vel, generalized_Acc, phase_Disp, phase_Vel, phase_Acc, harmonic_Disp, Harmonic Energies, Quality Factors, Circuit Element Current,power and node potentials etc.
  - Mechanical (Stress, Displacement, Reaction Force, Contact Stress, Strain),
  - Thermal (Heat Flux, Temperature),
  - Electrothermal (Heat Flux, Temperature, Electrical Potential, Current, Density, Reaction Current,Electric Field),

        - Electrothermomechanical (Heat Flux, Temperature, Electrical Potential, Current Density, Reaction Current, Stress, Displacement, Reaction Force Strain, Electric Field)
        - Piezoelectric (Displacement, Stress, Reaction Force, Electrical Potential, Reaction Charge Strain, Electric Field)
        - Modal (Modal Displacement Stress, Strain)
        - Modal Harmonic(Modal Displacement, Displacement, Stress Strain, Electric Field, Velocity,Acceleration)
        - Direct Harmonic (Displacement, Stress, Charge Density* Strain, Electric Field, Velocity,Acceleration)
    - Coupled Solvers for multi physics domains.
    - 2D plots and 3D results of the model.
    - Parametric simulations capabilities.
    - Pull-in Analysis and Lift-off analysis & Electrostatic Spring Softening capabilities.
    - Results in coupled domain include Surface results (Charge Density, Electrostatic Pressure, and Displacement), Volume results (Contact Traction (if there is contact), Contact Pressure, Reaction Force, Stress, and Displacement), Displacement, Reaction & contact Forces, Capacitance, Charge, voltage, Electrostatic force, Pull-in etc.
    - 2D plots and 3D model of results
    - **Harmonic Analysis** of resonators under a combination of DC and AC electrical forcing for frequency-domain solutions.
    - Harmonic analysis results
        - Surface results (Charge Density, Electrostatic Pressure, Displacement, Electric Field X, Y, Z, and Electric Field Mag.),Volume results (X, Y, Z, Reaction Force X, Y, or Z, Mises Stress, Tresca Stress, Hydrostatic Stress, Third Invariant Stress, Stress XX, YY, ZZ, XY, XZ, or YZ, Principal Stress 1, 2, or 3, Displacement X, Y, or Z, Displacement Mag. and Modal Displacement Mag.)
    - Solver to compute the mass inertias of the movable parts of the device, the centroids, and the moments of inertia.
    - **Squeezed Film** (Reynolds Flow) fluid between parallel surfaces with a motion normal to the gap.
    - **Slide Film** (Couette Flow) fluid between parallel surfaces with motion parallel to the gap.
    - **Steady Stokes Flow** for fluid damping due to general, unrestricted geometries and general body motions.
    - module to compute the frequency-dependent resistance and inductance matrices for a set of conductors which can be applied to magnetic sensor design, on-chip passive inductor analysis, and parasitic extraction for packaging analysis.
    - PZR module uses applied stress and the material's PZR coefficients to compute the piezoresistive sensor's potential field and the resulting change in current.
    - Modules to simplify the complexities of MEMS design and simulation by generating reduced-order models, or macromodels, of design components and provides the ability to extract macromodels of linear mechanical, non-linear mechanical, electrical, and electromechanical flexible structures (springs).
    - Module for simulating packaging effects on Device performance.
- **Software must capable to run in both Windows and Linux Environments.**
- **Must capable to interact with third party tools.**
- Contain standard package libraries like Kyocera and Hymite packages, which can be used for package design and for simulation of a device/package interaction and produce accurate results.

- Analyze the effects of the package on the MEMS device and can consider the effects of packaging early in the design phase.
- Availability of open-tooled packaging solutions, the user has more choices for initial package selection in terms of chip size, number of electrical connection, etc
- Standard Package Library includes variety of packages like including SMD (Surface Mount Device), LCC (Leadless Chip Carrier), PGA (Pin Grid Array), S/B (Side Braze), C-DIP (Cerdip, Ceramic, Dual-In-Line Package), as well as sealing lids.
- Availability of standard package library information such as materials, process, layout, 3D-solid model & drawings of packages.
- Package library corresponding to each application domain such as pressure sensors, inertial sensors, optical MEMS devices, and RF MEMS devices, etc and provide the information on selection of package selectivity type for the.
- Provide packages selection criteria details for the application domains.
- Ability to customize the standard package as per the user requirement.
- Plot the package simulation results in 2D and visualize the 3D model results.
- Provides tutorials on using the package libraries.