Technical Specifications of Heart Lung Machine: (Cardiopulmonary Bypass machine)	
S.No.	**Descriptions**
1	The unit should have 4 large pumps and 2 small pumps with all of them being mast mounted. These pumps can be used as an arterial, suction, vent and cardioplegia with separate power supply and control modules.
2	Should have easy access connectors for interchanging the pump and it should also have a separate port for connecting the pump during emergency situations.
3	The pumps should show accurate measurements and the machine can be used for performing all types of Cardiac surgeries.
4	Machine should show the measured flow/ calculated flow for Arterial Roller Pump.
5	Pumps should have direct drive system. Each Module should work on its own. Each Pump should have easy mechanism for occlusion setting for different thickness of tubes available in the market. Occlusion should be of thumb wheel lock mechanism with accuracy of 0.015mm or better.
6	Roller pump should have a self-diagnostic circuit with provision to detect and display critical alarm conditions. Machine should show all warnings and alarms in complete text message and different audible tones with different colour coding.
7	Machine should be able to configure all thresholds, alarms, settings, Pump assignments in up to 12 different User Profiles
8	Should have a spill proof stainless steel base.
9	All the pumps should have individually controlled knobs allowing fine tuning and coarse adjustment of flows. The machine should have embedded back-up controllers in case of main control failure.
10	All the pump heads should be rotatable to optimise the tubing length and contribute towards minimizing haemodilution.
11	The unit should be supplied with a Battery backup of minimum of 90 minutes for fully loaded machine with all pumps running. Switch over from main power to battery backup should be automatic and immediate. The battery unit should be built into the pump base, and it should be recharged automatic and immediate with battery test information and time remaining feature. The machine should be able to start on battery.
12	Should have hand crank facility as a critical safety feature hand crank loading should be from top for faster access. Pump should give audible sound if rotated in wrong set direction.
13	The display monitor should be able to control remotely all electronic sensors and devices like inline blood monitor, Heater cooler unit, Electronic Venous clamp connected to the machine.
14	The display monitor should have an option to show up to minimum of 4 timers and 2 countdown timers.
15	Pressure Sensor and Level Sensor should have 2 modes – Stop Mode & Control Mode.
16	The machine should be supplied with following minimum safety modules: 1. One Pressure module with 2 pressure monitoring outlets. 2. One Bubble module with ability to connect 2 or more sensors provided with 3/8 and ¼ bubble sensors. 3. One Level sensor.

	4. One Temperature module with ability to measure 2 or more different temperatures. 5. One flow sensor to get the measured flow
17	The machine should have ability to deliver Cardioplegia in two modes - Manual and/or Automatic (including all pre-set ratios if automatic)
18	The machine should be provided with mechanical gas blender and should not require manual calibrations.
19	The machine should have Electronic Venous Clamp linked to the safety modules and can be controlled either from main display of machine or from separate controller.
20	The machine should have Patient Monitor which should continuously display and store all parameters from Heart Lung Machine, up to 6 External Devices available within the operating theatre like anaesthesia monitor, NIRS monitors, Blood gas analyzers, ACT devices etc.The connecting cables/interphase cables for all such machines should be supplied along with the machines. The vendor should visit the hospital and make a note of all such equipment before submitting their bid. It is the responsibility of vendor to coordinate/communicate with the OEM of the above equipment to establish the required connectivity.
21	The Patient Monitor should also have the facility to set up quality indicators and thresholds.
22	The Patient Monitor should display Goal Directed Perfusion parameters.
23	The Patient Monitor should have an option to connect through HL7 to Hospital Electronic Medical Records.
24	Product should be BIS/ European CE & USFDA approved.
25	The bidder to provide short and long arm along with holders for control modules if required as per machine configuration.
26	Two adult blankets and two paediatric blankets to be provided with each machine.
	The bidder should also quote for the following accessories / modules :
	1. **Inline blood Monitoring system:** The machine should have Inline Blood Parameter Monitoring to measure Venous and Arterial parameters with possibility to control from the main display of machine. Also to be provided both 20 arterial and 10 venous cuvettes or 30 kits as applicable.
	2. **The centrifugal pump:** The Centrifugal Pump with Arterial Clamp should also have an option to connect second centrifugal pump which can be used for Kinetic Venous drainage.
	3. The machine should be supplied with one unit of **VACUUM ASSISTED VENOUS DRAINAGE (VAVD**) system with following specifications: • Should have Accurate and easy regulation and control of the vacuum supply to the venous reservoir • Should have positive, negative pressure relief valves. • Should have the Tube connection to vacuum source should 1/4" wire reinforced connector • Should have the Tube connection to reservoir should 1/4" wire reinforced connector • Should adopt the Vacuum source (– 200 to – 760) mmHg, min. flow 11 litres/min. • Should have Vacuum regulation limits should 0 to – 100 ± 10 mmHg • Should have Off/Regulate modes • Should have Pressure Meter Mechanical, class 1.6, 0 to – 120 mmHg • Should Supply with the pole mount bracket and 1/4" tubing nipple connections

	Heater Cooler Machine
1	The unit shall be capable of supplying water of temperature 3 - 41 degree Celsius for patient circuit, 2-10 degree Celsius for Cold cardioplegia and 15-41 degree Celsius for warm cardioplegia circuit.
2	The unit should have 2 or more independent tanks and 2 or more separate circuits, and these circuits should be able to control patient's temperature and also heating and cooling of cardioplegia and should work simultaneously. Should have easy de-airing process. Should have easy drainage system. Should be supplied with bacteria collection aerosol canisters.
3	The accuracy should be at least 0.1 C. Settings should be adjustable to approx. 0.1
4	The heater cooler unit should also be compatible to get integrated into the heart lung machine.
5	Product should be BIS/European CE and USFDA approved.
	Warranty for the complete Unit:
1	Standard warranty should come for Five Years.
2	Maintenance Service During Warranty Period: During the warranty period supplier must ensure two planned preventive maintenance (PPM) in a year along with corrective/breakdown maintenance whenever required.
3	Bidder should also quote for Five years of CMC after the expiry of warranty period.
	Training
1	It is the responsibility of the bidder to train the local perfusionist and other staff involved in the handling and maintenance of the machine.