

**INDIAN MARITIME UNIVERSITY  
KOLKATA CAMPUS**

No. IMU-KC/Laboratory Equipment/16-17

Date: 17.02.2017

Sub: Quotation for procurement of Instruments for Electrical Machine  
Laboratory at IMU-Kolkata Campus

Sealed quotations are invited towards procurement of Instruments for Electrical Machine Laboratory at IMU-KC under two bid systems i.e. Technical Bid and Financial Bid. The details of the instruments are as follows:

Sl. No.	Items	Specifications	Qty	Unit
01	Different method of starting of 3 phase squirrel cage Induction motor & their comparison [D.O.L, Auto transformer & Star Delta]	<p>1no 2 HP, 3-phase, 415V, 50Hz, 1500 rpm, 4-pole Squirrel Cage Induction motor AC INDUCTION MOTOR Power: 2HP; Voltage: 415±10% V AC; Current: 3.3A AC; Speed: 1425 RPM; Frequency: 50 C/S; Frame: 80 Rating: Cont; Ins. CL. B; Phase: 3 Rubber mat for reducing vibration of above system. Panel Box (48 inch X 24 inch X 8 inch) as per required of 18 gauge CRC sheet, Powder coating, I.P. Protection, Neoprene rubber gasket, Colour- of white. Panel made of two back door &amp; locking arrangements with table top self stand type. (48 inch X 24 inch X 30 inch) wooden table for panel mountain top 1 no AUTO TRANSFORMER TYPE Starter. 1 no STAR-DELTA Starter. 1no Digital Voltmeter Panel type (0-500v) (MIV) (4" x 4" or 4" x 2" dial). 1no Digital Ammeter Panel type (0-5amp) (MIA) (4" x 4" or 4" x 2" dial). 1no Analog type AC ammeter (0-10amp) (MIA) (4" x 4" or 4" x 2" dial). Digital noncontact type tachometer. (Range 0-9999 RPM); Fuse protection; Overload protection Off on switch and power plug; All terminals &amp; electrical instruments are to be available on the Bakelite panel board.</p>	01	Set
02	Speed control of 3 phase squirrel cage induction motor by different methods & their	<p>1no 1 HP, 3-phase, 415V, 50Hz, 1500 rpm, 4-pole and 2-pole Squirrel Cage Induction motor AC INDUCTION MOTOR Power: 1HP; Voltage: 415±10% V AC; Current: 2.1A AC; Speed: 1425 RPM and 2800 RPM; Frequency: 50 C/S; Frame: 80; Rating: Cont; Ins. CL. B; Phase: 3</p>	01	Set

	comparison [voltage /frequency control]	<p>Rubber mat for reducing vibration of above system.</p> <p>Panel Box (48 inch X 24 inch X 8 inch) as per required of 18 gauge CRC sheet, Powder coating, I.P. Protection, Neoprene rubber gasket, Colour- of white. Panel made of two back door &amp; locking arrangements with table top self stand type.</p> <p>(48 inch X 24 inch X 30 inch) wooden table for panel mountain top</p> <p>1 no V/F controller</p> <p>1no Digital Voltmeter Panel type (0-500v) (MIV) (4" x 4" or 4" x 2" dial).</p> <p>1no Digital Ammeter Panel type (0-10amp) (MIA) (4" x 4" or 4" x 2" dial).</p> <p>Digital noncontact type tachometer. (Range 0-9999 RPM); Fuse protection; Overload protection</p> <p>Off on switch and power plug. All terminals &amp; electrical instruments are to be available on the Bakelite panel board.</p>		
03	Determination of regulation of Synchronous machine by Synchronous Impedance & Potier reactance method.	<p>DC SHUNT MOTOR</p> <p>Power: 2HP; Frame Size: 132</p> <p>Armature Voltage: 220V DC; Armature Current: 8.3A DC; Field/Exc. Voltage: 220V DC; Field/Exc. Current: 0.88A DC; Speed: 1500 RPM; Duty: S1</p> <p>Encl.: IP-21; Ins. CL.: B; Commutators Segment: 63; Brgs D.E.: 6205; Brgs N.D.E.: 6204</p> <p>AC ALTERNATOR</p> <p>Power: 1KVA; Supply Voltage: 415V AC</p> <p>P.F.: 0.8; Current: 2.0A AC; Field/Exc. Voltage: 180V DC; Field/Exc. Current: 0.8A DC; Speed: 1500 RPM</p> <p>Duty: S1; Encl.: IP-21; Ins. CL.: F; Brgs D.E.: 6206</p> <p>Brgs N.D.E.: 6205</p> <p>Both the machines are flexibly coupled and mounted on sturdy M.s. channel base.</p> <p>The terminals of armature and shunt/series field windings of both the machines are brought over to Bakelite plate fixed on C.I. terminal box fitted on top of machine.</p> <p>Rubber mat for reducing vibration of above system.</p> <p>Panel Box (48 inch X 24 inch X 8 inch) as per required of 18 gauge CRC sheet, Powder coating, I.P. Protection, Neoprene rubber gasket, Colour- of white. Panel made of two back door &amp; locking arrangements with table top self stand type.</p> <p>(48 inch X 24 inch X 30 inch) wooden table for panel mountain top</p> <p>2no Digital Voltmeter Panel type (0-300v) (MCV) (4" x 4" or 4" x 2" dial).</p> <p>1no Digital Ammeter Panel type (0-1amp) (MCA) (4" x 4" or 4" x 2" dial).</p>	01	Set

		<p>1no Digital Ammeter Panel type (0-10amp) (MCA) (4" x 4" or 4" x 2" dial).</p> <p>3no Digital Ammeter Panel type (0-10amp) (MIA) (4" x 4" or 4" x 2" dial).</p> <p>1no Digital Voltmeter Panel type (0-500v) (MIV) (4" x 4" or 4" x 2" dial).</p> <p>Thyristor control Dc drive (Armature variable voltage , current adjustable, IR compensation, Minimum and maximum speed limits, Field open trip), Variable DC source for both motor and Alternator field. Electrical inductive loading arrangement with minimum 3 steps variation capability. Fuse protection. Overload protection. Off on switch and power plug. Digital noncontact type tachometer. (Range 0-9999 RPM). All terminals &amp; electrical instruments are to be available on the Bakelite panel board.</p>		
04	<p>Determination the Slip Torque characteristics of an Induction motor and to find out the full load slip.</p>	<p>2 HP, 3-phase, 400v, 50Hz, 1500 rpm, 4-pole Squirrel Cage Induction motor AC INDUCTION MOTOR Power: 2HP; Voltage: 415±10% V AC; Current: 3.3 AC; Speed: 1425 RPM; Frequency: 50 C/S; Frame: 80 Rating: Cont Ins. CL. B; Phase: 3 DC SEPARATELY EXCITED GENERATOR Power: 2HP; Frame Size: 132; Armature Voltage: 220V DC; Armature Current: 8.3A DC; Field/Exc. Voltage: 220V DC; Field/Exc. Current: 0.88A DC Speed: 1500 RPM; Duty: S1 Encl.: IP-21; Ins. CL.: B; Commutators Segment: 63 Brgs D.E.: 6205; Brgs N.D.E.: 6204 Rubber mat for reducing vibration of above system. Panel Box (48 inch X 24 inch X 8 inch) as per required of 18 gauge CRC sheet, Powder coating, I.P. Protection, Neoprene rubber gasket, Colour- of white. Panel made of two back door &amp; locking arrangements with table top self stand type. (48 inch X 24 inch X 30 inch) wooden table for panel mountain top. Spring balance arrangement with water-pulley and two spring balance one. Base plate and coupling arrangement one. 1no Voltmeter(0-500v)(MIV), (4" x 4" or 4" x 2" dial). 1noAmmeter(0-5)(MIA), (4" x 4" or 4" x 2" dial). 1no Wattmeter, (4" x 4" or 4" x 2" dial). 1no three phase Variable AC source, 1no Voltmeter(0-300v)(MVC), (4" x 4" or 4" x 2" dial). 1no Ammeter(0-10)(MCA), (4" x 4" or 4" x 2" dial). 3-phase off-on switch; digital tacho-meter Fuse protection; Electrical resistive type Loading arrangements for DC generator;</p>	01	Set

		<p>Overload protection</p> <p>Power plug; All terminals are to be available on the panel board; Instruction Manual</p> <p>All meters (Digital Panel type) are of CABES ELECTRA make (4"x4" or 4" X 2" dial).</p>		
05	To make connection diagram of full pitch & fractional slot winding of 18 slot squirrel cage Induction motor for 2 pole & 4 pole operation.	<p>1 no 1 HP, 3-phase, 415V, 50Hz, 1500 rpm, 4-pole and 2-pole Squirrel Cage Induction motor</p> <p>AC INDUCTION MOTOR</p> <p>Power: 1HP; Voltage: 415±10% V AC</p> <p>Current: 2.1A AC; Speed: 1425 RPM and 2800 RPM</p> <p>Frequency: 50 C/S; Frame: 80; Rating: Cont Ins. CL. B; Phase: 3</p> <p>Rubber mat for reducing vibration of above system.</p> <p>Panel Box (48 inch X 24 inch X 8 inch) as per required of 18 gauge CRC sheet, Powder coating, I.P. Protection, Neoprene rubber gasket, Colour- of white. Panel made of two back door &amp; locking arrangements with table top self stand type.</p> <p>(48 inch X 24 inch X 30 inch) wooden table for panel mountain top. 1 no Voltmeter(0-500v)(MIV), (4"x4" or 4" X 2" dial). 1 no Ammeter(0-5)(MIA), (4"x4" or 4" X 2" dial). 1 no three phase Variable AC source; 3-phase off-on switch; digital tacho-meter; Fuse protection; Overload protection; Power plug. All terminals are to be available on the panel board. All meters (Digital Panel type) are of CABES ELECTRA make (4"x4" or 4" X 2" dial).</p>	01	Set
06	Parallel operation of three phase alternator.	<p>2 No. Alternator: 1KVA/415V/50Hz/1500 rpm</p> <p>2 No. DC Shunt Motor: 2 hp/220V/1500 rpm</p> <p>Panel board for the experiment consists of M. S. Channel, Bakelite board.</p> <p>It includes the following:</p> <p>For DC MOTOR AS PRIME MOVER</p> <p>2 nos MC Voltmeter 96 x 96 mm digital panel mounted 0-300V. 2 nos MC Ammeter 96 x 96 mm digital panel mounted 0-10 A. DC speed regulator and controller</p> <p>Indicating light.</p> <p>FOR ALTERNATOR</p> <p>2 nos MI Voltmeter 96 x 96 mm digital panel mounted 0-500V... 2 nos MI Ammeter 96 x 96 mm digital panel mounted 0-10 A. 2 nos Frequency meter 96 x 96 mm digital panel mounted 0-10 A. 2 nos Rheostat 1 A. 500 Ohms. Indicating light</p> <p>Motor Alternator coupled with separately in a common base plate (2 sets Coupling arrangement 2 set)</p> <ul style="list-style-type: none"> <li>• Provision of A.C. / D.C. power supply (what ever is needed)</li> </ul> <p>ACCESSORIES</p>	01	Set

		<ul style="list-style-type: none"> <li>• Tachometer and provision for speed measurement</li> <li>• Fuse protection</li> <li>• Off on switch and power plug</li> <li>• Over speed trip</li> <li>• Phase failure relay</li> <li>• Adjustable reverse current relay</li> <li>• Panel board for the experiment consists of M. S. Channel, Bakelite board (6mm)</li> <li>• All terminals are to be available on the panel board.</li> <li>• 3 nos Change Over Switch for parallel operation (manual type)</li> <li>• 3 nos Change Over Switch for parallel operation (Push button operated ACB TYPE)</li> <li>• 2 nos Variable DC Source for motor</li> <li>• 2 nos Single Phase Variac for alternator field.</li> <li>• 6 sets 10 w Lamp for lamp method synchronization</li> <li>• 4 nos 50A Copper BUS-BAR.</li> <li>• 1 no Frequency Meter with change over switch</li> <li>• 1 no Synchroscope meter with (PT) for synchronization method.</li> <li>• 1 no 0-500V ac meter analog type for synchronization method.</li> <li>• All terminals are to be available on the panel board</li> <li>• All meters (Digital Panel type) are of CABES ELECTRA make (4"x4" or 4" X 2" dial).</li> </ul>		
07	Cut Section of 3 phase squirrel cage induction motor and Alternator.	2 HP, 3-phase, 400v, 50Hz, 1500 rpm, 4-pole Squirrel Cage Induction motor. Alternator: 1KVA/415V/50Hz/1500 rpm	01	Set each

**Terms & conditions :**

- (i) The tender is for all the items i.e. 01 to 07. A bidder may quote for individual item or all the items in the tender. Each item will be considered on the basis of L1 price for that item.
- (ii) The Bid submitted will be evaluated based on the details of technical qualification submitted by the bidder under Cover I in the prescribed formats to ascertain whether the bidders qualify. The Cover II (Price Bid) of only those firms who technically qualify as per the documents in Cover I will be opened. The format for Technical Bid is given in Annexure-I, while price bid format is given in Annexure-II
- (iii) The Cover I shall be addressed to "The Director, Indian Maritime University – Kolkata Campus" and should be duly superscribed as "Cover-I-Technical Bid for procurement of Instruments for Electrical Machine Laboratory at IMU-KC" and sealed properly. Name and Address of the bidder shall also be written/ printed on the cover.

- (iii) The Cover II shall be addressed to “The Director, Indian Maritime University – Kolkata Campus” and should be duly super scribed as ”Cover-II-Price Bid for procurement of Instruments for Electrical Machine Laboratory at IMU-KC” and sealed properly. Name and Address of the bidder shall also be written/ printed on the cover.
- (iv) Main Cover  
Both the “Cover I” and “Cover II” shall be placed inside the main cover, which shall be a addressed to “The Director, Indian Maritime University – Kolkata Campus P-19,Taratala Road, Kolkata: 700088, West Bengal, India” and the main cover should be duly superscribed as “Tender for procurement of Instruments for Electrical Machine Laboratory at IMU-KC” and sealed properly.
- (iv) The rates quoted should be comprehensive and inclusive of all taxes, delivery charges, installation, commissioning and trail run.
- (v) Last date of submission of quotation is 10.03.2017.
- (vi) The Equipment should be delivered and installed within the period of 4 weeks from the date of issue of Purchase Order. If the bidder fails to deliver and place any or all the Equipments or perform the service by the specified date, penalty at the rate of 1% per week of the total order value subject to the maximum of 10% of total order value will be deducted.
- (vii) Delivery of the above items should be made at IMU - Kolkata Campus at P-19, Taratala Road, Kolkata 700 088.
- (viii) Rates quoted should be valid for a period of 2 months from the last date of submission of the bids. Other than the increase in taxes imposed by statutory authority, no change in the rate is acceptable during the period.
- (ix) Conditional bids will not be accepted.
- (x) 100% Payment will be made through Bank Transfer after successful installation, delivery and trial run of the equipments.
- (xi) Minimum 3 years free service warranty should be given for the equipment/equipments. Calls should be attended within 24 hrs. in case of any break down.

Sd/-

O.I.C. - Purchase

To  
The Director  
Indian Maritime University – Kolkata Campus  
P-19 Taratala Road, Kolkata – 7000 88

Dear Sir,

Having agreed to the terms and condition of the tender, we hereby submit our Technical Bid for “Procurement of Instruments for Electrical Machine Laboratory at IMU-KC” as detailed below

**Annexure - I**

**Format of Technical Bid**

**Procurement of Instruments for Electrical Machine Laboratory at IMU-KC**

Sl. No.	Items	Specifications	Qty	Unit	Compliance
01	Different method of starting of 3 phase squirrel cage Induction motor & their comparison [D.O.L, Auto transformer & Star Delta]	1no 2 HP, 3-phase, 415V, 50Hz, 1500 rpm, 4-pole Squirrel Cage Induction motor AC INDUCTION MOTOR Power: 2HP; Voltage: 415±10% V AC; Current: 3.3A AC; Speed: 1425 RPM; Frequency: 50 C/S; Frame: 80 Rating: Cont; Ins. CL. B; Phase: 3 Rubber mat for reducing vibration of above system. Panel Box (48 inch X 24 inch X 8 inch) as per required of 18 gauge CRC sheet, Powder coating, I.P. Protection, Neoprene rubber gasket, Colour- of white. Panel made of two back door & locking arrangements with table top self stand type. (48 inch X 24 inch X 30 inch) wooden table for panel mountain top 1 no AUTO TRANSFORMER TYPE Starter. 1 no STAR-DELTA Starter. 1no Digital Voltmeter Panel type (0-500v) (MIV) (4” x 4” or 4” x 2” dial). 1no Digital Ammeter Panel type (0-5amp) (MIA) (4” x 4” or 4” x 2” dial). 1no Analog type AC ammeter (0-10amp) (MIA) (4” x 4” or 4” x 2” dial). Digital noncontact type tachometer. (Range 0-9999 RPM); Fuse protection; Overload protection Off on switch and power plug; All terminals & electrical instruments are to be available on the Bakelite panel board.	01	Set	
02	Speed control of 3 phase squirrel cage induction motor by different methods & their	1no 1 HP, 3-phase, 415V, 50Hz, 1500 rpm, 4-pole and 2-pole Squirrel Cage Induction motor AC INDUCTION MOTOR Power: 1HP; Voltage: 415±10% V AC; Current: 2.1A AC; Speed: 1425 RPM and 2800 RPM; Frequency: 50 C/S; Frame: 80; Rating: Cont; Ins. CL. B; Phase: 3	01	Set	

	comparison [voltage /frequency control]	<p>Rubber mat for reducing vibration of above system.</p> <p>Panel Box (48 inch X 24 inch X 8 inch) as per required of 18 gauge CRC sheet, Powder coating, I.P. Protection, Neoprene rubber gasket, Colour- of white. Panel made of two back door &amp; locking arrangements with table top self stand type.</p> <p>(48 inch X 24 inch X 30 inch) wooden table for panel mountain top</p> <p>1 no V/F controller</p> <p>1no Digital Voltmeter Panel type (0-500v) (MIV) (4" x 4" or 4" x 2" dial).</p> <p>1no Digital Ammeter Panel type (0-10amp) (MIA) (4" x 4" or 4" x 2" dial).</p> <p>Digital noncontact type tachometer. (Range 0-9999 RPM); Fuse protection; Overload protection</p> <p>Off on switch and power plug. All terminals &amp; electrical instruments are to be available on the Bakelite panel board.</p>			
03	Determination of regulation of Synchronous machine by Synchronous Impedance & Potier reactance method.	<p>DC SHUNT MOTOR</p> <p>Power: 2HP; Frame Size: 132</p> <p>Armature Voltage: 220V DC; Armature Current: 8.3A DC; Field/Exc. Voltage: 220V DC; Field/Exc. Current: 0.88A DC; Speed: 1500 RPM; Duty: S1</p> <p>Encl.: IP-21; Ins. CL.: B; Commutators Segment: 63; Brgs D.E.: 6205; Brgs N.D.E.: 6204</p> <p>AC ALTERNATOR</p> <p>Power: 1KVA; Supply Voltage: 415V AC</p> <p>P.F.: 0.8; Current: 2.0A AC; Field/Exc. Voltage: 180V DC; Field/Exc. Current: 0.8A DC; Speed: 1500 RPM</p> <p>Duty: S1; Encl.: IP-21; Ins. CL.: F; Brgs D.E.: 6206</p> <p>Brgs N.D.E.: 6205</p> <p>Both the machines are flexibly coupled and mounted on sturdy M.s. channel base.</p> <p>The terminals of armature and shunt/series field windings of both the machines are brought over to Bakelite plate fixed on C.I. terminal box fitted on top of machine.</p> <p>Rubber mat for reducing vibration of above system.</p> <p>Panel Box (48 inch X 24 inch X 8 inch) as per required of 18 gauge CRC sheet, Powder coating, I.P. Protection, Neoprene rubber gasket, Colour- of white. Panel made of two back door &amp; locking arrangements with table top self stand type.</p> <p>(48 inch X 24 inch X 30 inch) wooden table for panel mountain top</p> <p>2no Digital Voltmeter Panel type (0-300v) (MCV) (4" x 4" or 4" x 2" dial).</p> <p>1no Digital Ammeter Panel type (0-1amp) (MCA) (4" x 4" or 4" x 2" dial).</p>	01	Set	

		<p>1no Digital Ammeter Panel type (0-10amp) (MCA) (4" x 4" or 4" x 2" dial).</p> <p>3no Digital Ammeter Panel type (0-10amp) (MIA) (4" x 4" or 4" x 2" dial).</p> <p>1no Digital Voltmeter Panel type (0-500v) (MIV) (4" x 4" or 4" x 2" dial).</p> <p>Thyristor control Dc drive (Armature variable voltage , current adjustable, IR compensation, Minimum and maximum speed limits, Field open trip), Variable DC source for both motor and Alternator field. Electrical inductive loading arrangement with minimum 3 steps variation capability. Fuse protection. Overload protection. Off on switch and power plug. Digital noncontact type tachometer. (Range 0-9999 RPM). All terminals &amp; electrical instruments are to be available on the Bakelite panel board.</p>			
04	<p>Determination the Slip Torque characteristics of an Induction motor and to find out the full load slip.</p>	<p>2 HP, 3-phase, 400v, 50Hz, 1500 rpm, 4-pole Squirrel Cage Induction motor AC INDUCTION MOTOR Power: 2HP; Voltage: 415±10% V AC; Current: 3.3 AC; Speed: 1425 RPM; Frequency: 50 C/S; Frame: 80 Rating: Cont Ins. CL. B; Phase: 3 DC SEPARATELY EXCITED GENERATOR Power: 2HP; Frame Size: 132; Armature Voltage: 220V DC; Armature Current: 8.3A DC; Field/Exc. Voltage: 220V DC; Field/Exc. Current: 0.88A DC Speed: 1500 RPM; Duty: S1 Encl.: IP-21; Ins. CL.: B; Commutators Segment: 63 Brgs D.E.: 6205; Brgs N.D.E.: 6204 Rubber mat for reducing vibration of above system. Panel Box (48 inch X 24 inch X 8 inch) as per required of 18 gauge CRC sheet, Powder coating, I.P. Protection, Neoprene rubber gasket, Colour- of white. Panel made of two back door &amp; locking arrangements with table top self stand type. (48 inch X 24 inch X 30 inch) wooden table for panel mountain top. Spring balance arrangement with water-pulley and two spring balance one. Base plate and coupling arrangement one. 1no Voltmeter(0-500v)(MIV), (4" x 4" or 4" x 2" dial). 1noAmmeter(0-5)(MIA), (4" x 4" or 4" x 2" dial). 1no Wattmeter, (4" x 4" or 4" x 2" dial). 1no three phase Variable AC source, 1no Voltmeter(0-300v)(MVC), (4" x 4" or 4" x 2" dial). 1no Ammeter(0-10)(MCA), (4" x 4" or 4" x 2" dial). 3-phase off-on switch; digital tacho-meter Fuse protection; Electrical resistive type Loading arrangements for DC generator;</p>	01	Set	

		<p>Overload protection Power plug; All terminals are to be available on the panel board; Instruction Manual All meters (Digital Panel type) are of CABES ELECTRA make (4"x4" or 4" X 2" dial).</p>			
05	To make connection diagram of full pitch & fractional slot winding of 18 slot squirrel cage Induction motor for 2 pole & 4 pole operation.	<p>1no 1 HP, 3-phase, 415V, 50Hz, 1500 rpm, 4-pole and 2-pole Squirrel Cage Induction motor AC INDUCTION MOTOR Power: 1HP; Voltage: 415±10% V AC Current: 2.1A AC; Speed: 1425 RPM and 2800 RPM Frequency: 50 C/S; Frame: 80; Rating: Cont Ins. CL. B; Phase: 3 Rubber mat for reducing vibration of above system. Panel Box (48 inch X 24 inch X 8 inch) as per required of 18 gauge CRC sheet, Powder coating, I.P. Protection, Neoprene rubber gasket, Colour- of white. Panel made of two back door &amp; locking arrangements with table top self stand type. (48 inch X 24 inch X 30 inch) wooden table for panel mountain top. 1no Voltmeter(0-500v)(MIV), (4"x4" or 4" X 2" dial). 1 no Ammeter(0-5)(MIA), (4"x4" or 4" X 2" dial). 1no three phase Variable AC source; 3-phase off-on switch; digital tacho-meter; Fuse protection; Overload protection; Power plug. All terminals are to be available on the panel board. All meters (Digital Panel type) are of CABES ELECTRA make (4"x4" or 4" X 2" dial).</p>	01	Set	
06	Parallel operation of three phase alternator.	<p>2 No. Alternator: 1KVA/415V/50Hz/1500 rpm 2 No. DC Shunt Motor: 2 hp/220V/1500 rpm Panel board for the experiment consists of M. S. Channel, Bakelite board. It includes the following: For DC MOTOR AS PRIME MOVER 2 nos MC Voltmeter 96 x 96 mm digital panel mounted 0-300V. 2 nos MC Ammeter 96 x 96 mm digital panel mounted 0-10 A. DC speed regulator and controller Indicating light. FOR ALTERNATOR 2 nos MI Voltmeter 96 x 96 mm digital panel mounted 0-500V... 2 nos MI Ammeter 96 x 96 mm digital panel mounted 0-10 A. 2 nos Frequency meter 96 x 96 mm digital panel mounted 0-10 A. 2 nos Rheostat 1 A. 500 Ohms. Indicating light Motor Alternator coupled with separately in a common base plate (2 sets Coupling arrangement 2 set) • Provision of A.C. / D.C. power supply (what ever is needed) ACCESSORIES</p>	01	Set	

		<ul style="list-style-type: none"> <li>• Tachometer and provision for speed measurement</li> <li>• Fuse protection</li> <li>• Off on switch and power plug</li> <li>• Over speed trip</li> <li>• Phase failure relay</li> <li>• Adjustable reverse current relay</li> <li>• Panel board for the experiment consists of M. S. Channel, Bakelite board (6mm)</li> <li>• All terminals are to be available on the panel board.</li> <li>• 3 nos Change Over Switch for parallel operation (manual type)</li> <li>• 3 nos Change Over Switch for parallel operation (Push button operated ACB TYPE)</li> <li>• 2 nos Variable DC Source for motor</li> <li>• 2 nos Single Phase Variac for alternator field.</li> <li>• 6 sets 10 w Lamp for lamp method synchronization</li> <li>• 4 nos 50A Copper BUS-BAR.</li> <li>• 1no Frequency Meter with change over switch</li> <li>• 1 no Synchroscope meter with (PT) for synchronization method.</li> <li>• 1 no 0-500V ac meter analog type for synchronization method.</li> <li>• All terminals are to be available on the panel board</li> <li>• All meters (Digital Panel type) are of CABES ELECTRA make (4"x4" or 4" X 2" dial).</li> </ul>			
07	Cut Section of 3 phase squirrel cage induction motor and Alternator.	2 HP, 3-phase, 400v, 50Hz, 1500 rpm, 4-pole Squirrel Cage Induction motor. Alternator: 1KVA/415V/50Hz/1500 rpm	01	Set each	

Yours faithfully,

Date

Place: Signature with Seal of Authorized Signatory

To  
The Director  
Indian Maritime University – Kolkata Campus  
P-19 Taratala Road, Kolkata – 7000 88

Dear Sir,

Having agreed to the terms and condition of the tender, we hereby submit our Financial Bid for “Procurement of Instruments for Electrical Machine Laboratory at IMU-KC” as detailed below

**Annexure-II**

**Format of Price Bid**

**Procurement of Instruments for Electrical Machine Laboratory at IMU-KC**

Sl. No.	Items	Specifications	Qty	Unit	Price (Rs.)
01	Different method of starting of 3 phase squirrel cage Induction motor & their comparison [D.O.L, Auto transformer & Star Delta]	1no 2 HP, 3-phase, 415V, 50Hz, 1500 rpm, 4-pole Squirrel Cage Induction motor AC INDUCTION MOTOR Power: 2HP; Voltage: 415±10% V AC; Current: 3.3A AC; Speed: 1425 RPM; Frequency: 50 C/S; Frame: 80 Rating: Cont; Ins. CL. B; Phase: 3 Rubber mat for reducing vibration of above system. Panel Box (48 inch X 24 inch X 8 inch) as per required of 18 gauge CRC sheet, Powder coating, I.P. Protection, Neoprene rubber gasket, Colour- of white. Panel made of two back door & locking arrangements with table top self stand type. (48 inch X 24 inch X 30 inch) wooden table for panel mountain top 1 no AUTO TRANSFORMER TYPE Starter. 1 no STAR-DELTA Starter. 1no Digital Voltmeter Panel type (0-500v) (MIV) (4” x 4” or 4” x 2” dial). 1no Digital Ammeter Panel type (0-5amp) (MIA) (4” x 4” or 4” x 2” dial). 1no Analog type AC ammeter (0-10amp) (MIA) (4” x 4” or 4” x 2” dial). Digital noncontact type tachometer. (Range 0-9999 RPM); Fuse protection; Overload protection Off on switch and power plug; All terminals & electrical instruments are to be available on the Bakelite panel board.	01	Set	
02	Speed control of 3 phase squirrel cage induction motor	1no 1 HP, 3-phase, 415V, 50Hz, 1500 rpm, 4-pole and 2-pole Squirrel Cage Induction motor AC INDUCTION MOTOR Power: 1HP; Voltage: 415±10% V AC;	01	Set	

	by different methods & their comparison [voltage /frequency control]	<p>Current: 2.1A AC; Speed: 1425 RPM and 2800 RPM; Frequency: 50 C/S; Frame: 80; Rating: Cont; Ins. CL. B; Phase: 3</p> <p>Rubber mat for reducing vibration of above system.</p> <p>Panel Box (48 inch X 24 inch X 8 inch) as per required of 18 gauge CRC sheet, Powder coating, I.P. Protection, Neoprene rubber gasket, Colour- of white. Panel made of two back door &amp; locking arrangements with table top self stand type.</p> <p>(48 inch X 24 inch X 30 inch) wooden table for panel mountain top</p> <p>1 no V/F controller</p> <p>1no Digital Voltmeter Panel type (0-500v) (MIV) (4" x 4" or 4" x 2" dial).</p> <p>1no Digital Ammeter Panel type (0-10amp) (MIA) (4" x 4" or 4" x 2" dial).</p> <p>Digital noncontact type tachometer. (Range 0-9999 RPM); Fuse protection; Overload protection</p> <p>Off on switch and power plug. All terminals &amp; electrical instruments are to be available on the Bakelite panel board.</p>			
03	Determination of regulation of Synchronous machine by Synchronous Impedance & Potier reactance method.	<p>DC SHUNT MOTOR</p> <p>Power: 2HP; Frame Size: 132</p> <p>Armature Voltage: 220V DC; Armature Current: 8.3A DC; Field/Exc. Voltage: 220V DC; Field/Exc. Current: 0.88A DC; Speed: 1500 RPM; Duty: S1</p> <p>Encl.: IP-21; Ins. CL.: B; Commutators Segment: 63; Brgs D.E.: 6205; Brgs N.D.E.: 6204</p> <p>AC ALTERNATOR</p> <p>Power: 1KVA; Supply Voltage: 415V AC</p> <p>P.F.: 0.8; Current: 2.0A AC; Field/Exc. Voltage: 180V DC; Field/Exc. Current: 0.8A DC; Speed: 1500 RPM</p> <p>Duty: S1; Encl.: IP-21; Ins. CL.: F; Brgs D.E.: 6206</p> <p>Brgs N.D.E.: 6205</p> <p>Both the machines are flexibly coupled and mounted on sturdy M.s. channel base.</p> <p>The terminals of armature and shunt/series field windings of both the machines are brought over to Bakelite plate fixed on C.I. terminal box fitted on top of machine.</p> <p>Rubber mat for reducing vibration of above system.</p> <p>Panel Box (48 inch X 24 inch X 8 inch) as per required of 18 gauge CRC sheet, Powder coating, I.P. Protection, Neoprene rubber gasket, Colour- of white. Panel made of two back door &amp; locking arrangements with table top self stand type.</p> <p>(48 inch X 24 inch X 30 inch) wooden table for panel mountain top</p> <p>2no Digital Voltmeter Panel type (0-300v)</p>	01	Set	

		<p>(MCV) (4" x 4" or 4" x 2" dial).  1no Digital Ammeter Panel type (0-1amp)  (MCA) (4" x 4" or 4" x 2" dial).  1no Digital Ammeter Panel type (0-10amp)  (MCA) (4" x 4" or 4" x 2" dial).  3no Digital Ammeter Panel type (0-10amp)  (MIA) (4" x 4" or 4" x 2" dial).  1no Digital Voltmeter Panel type (0-500v)  (MIV) (4" x 4" or 4" x 2" dial).  Thyristor control Dc drive (Armature variable voltage , current adjustable, IR compensation, Minimum and maximum speed limits, Field open trip), Variable DC source for both motor and Alternator field. Electrical inductive loading arrangement with minimum 3 steps variation capability. Fuse protection. Overload protection. Off on switch and power plug. Digital noncontact type tachometer. (Range 0-9999 RPM). All terminals &amp; electrical instruments are to be available on the Bakelite panel board.</p>			
04	<p>Determination the Slip Torque characteristics of an Induction motor and to find out the full load slip.</p>	<p>2 HP, 3-phase, 400v, 50Hz, 1500 rpm, 4-pole Squirrel Cage Induction motor  AC INDUCTION MOTOR  Power: 2HP; Voltage: 415±10% V AC;  Current: 3.3 AC; Speed: 1425 RPM;  Frequency: 50 C/S; Frame: 80  Rating: Cont Ins. CL. B; Phase: 3  DC SEPARATELY EXCITED  GENERATOR  Power: 2HP; Frame Size: 132; Armature Voltage: 220V DC; Armature Current: 8.3A DC; Field/Exc. Voltage: 220V DC;  Field/Exc. Current: 0.88A DC  Speed: 1500 RPM; Duty: S1  Encl.: IP-21; Ins. CL.: B; Commutators Segment: 63  Brgs D.E.: 6205; Brgs N.D.E.: 6204  Rubber mat for reducing vibration of above system.  Panel Box (48 inch X 24 inch X 8 inch) as per required of 18 gauge CRC sheet, Powder coating, I.P. Protection, Neoprene rubber gasket, Colour- of white. Panel made of two back door &amp; locking arrangements with table top self stand type.  (48 inch X 24 inch X 30 inch) wooden table for panel mountain top. Spring balance arrangement with water-pulley and two spring balance one. Base plate and coupling arrangement one. 1no Voltmeter(0-500v)(MIV), (4" x 4" or 4" x 2" dial).  1noAmmeter(0-5)(MIA), (4" x 4" or 4" x 2" dial).  1no Wattmeter, (4" x 4" or 4" x 2" dial).  1no three phase Variable AC source,  1no Voltmeter(0-300v)(MVC), (4" x 4" or 4" x 2" dial).  1no Ammeter(0-10)(MCA), (4" x 4" or 4" x 2" dial).</p>	01	Set	

		<p>3-phase off-on switch; digital tachometer Fuse protection; Electrical resistive type Loading arrangements for DC generator; Overload protection Power plug; All terminals are to be available on the panel board; Instruction Manual All meters (Digital Panel type) are of CABES ELECTRA make (4"x4" or 4" X 2" dial).</p>			
05	To make connection diagram of full pitch & fractional slot winding of 18 slot squirrel cage Induction motor for 2 pole & 4 pole operation.	<p>1 no 1 HP, 3-phase, 415V, 50Hz, 1500 rpm, 4-pole and 2-pole Squirrel Cage Induction motor AC INDUCTION MOTOR Power: 1HP; Voltage: 415±10% V AC Current: 2.1A AC; Speed: 1425 RPM and 2800 RPM Frequency: 50 C/S; Frame: 80; Rating: Cont Ins. CL. B; Phase: 3 Rubber mat for reducing vibration of above system. Panel Box (48 inch X 24 inch X 8 inch) as per required of 18 gauge CRC sheet, Powder coating, I.P. Protection, Neoprene rubber gasket, Colour- of white. Panel made of two back door &amp; locking arrangements with table top self stand type. (48 inch X 24 inch X 30 inch) wooden table for panel mountain top. 1 no Voltmeter(0-500v)(MIV), (4"x4" or 4" X 2" dial). 1 no Ammeter(0-5)(MIA), (4"x4" or 4" X 2" dial). 1 no three phase Variable AC source; 3-phase off-on switch; digital tachometer; Fuse protection; Overload protection; Power pluge. All terminals are to be available on the panel board. All meters (Digital Panel type) are of CABES ELECTRA make (4"x4" or 4" X 2" dial).</p>	01	Set	
06	Parallel operation of three phase alternator.	<p>2 No. Alternator: 1KVA/415V/50Hz/1500 rpm 2 No. DC Shunt Motor: 2 hp/220V/1500 rpm Panel board for the experiment consists of M. S. Channel, Bakelite board. It includes the following: For DC MOTOR AS PRIME MOVER 2 nos MC Voltmeter 96 x 96 mm digital panel mounted 0-300V. 2 nos MC Ammeter 96 x 96 mm digital panel mounted 0-10 A. DC speed regulator and controller Indicating light. FOR ALTERNATOR 2 nos MI Voltmeter 96 x 96 mm digital panel mounted 0-500V... 2 nos MI Ammeter 96 x 96 mm digital panel mounted 0-10 A. 2 nos Frequency meter 96 x 96 mm digital panel mounted 0-10 A. 2 nos Rheostat 1 A. 500 Ohms. Indicating light Motor Alternator coupled with separately in a common base plate (2 sets Coupling arrangement 2 set)</p>	01	Set	

		<ul style="list-style-type: none"> <li>• Provision of A.C. / D.C. power supply (what ever is needed)</li> </ul> <p>ACCESSORIES</p> <ul style="list-style-type: none"> <li>• Tachometer and provision for speed measurement</li> <li>• Fuse protection</li> <li>• Off on switch and power plug</li> <li>• Over speed trip</li> <li>• Phase failure relay</li> <li>• Adjustable reverse current relay</li> <li>• Panel board for the experiment consists of M. S. Channel, Bakelite board (6mm)</li> <li>• All terminals are to be available on the panel board.</li> <li>• 3 nos Change Over Switch for parallel operation (manual type)</li> <li>• 3 nos Change Over Switch for parallel operation (Push button operated ACB TYPE)</li> <li>• 2 nos Variable DC Source for motor</li> <li>• 2 nos Single Phase Variac for alternator field.</li> <li>• 6 sets 10 w Lamp for lamp method synchronization</li> <li>• 4 nos 50A Copper BUS-BAR.</li> <li>• 1no Frequency Meter with change over switch</li> <li>• 1 no Synchroscope meter with (PT) for synchronization method.</li> <li>• 1 no 0-500V ac meter analog type for synchronization method.</li> <li>• All terminals are to be available on the panel board</li> <li>• All meters (Digital Panel type) are of CABES ELECTRA make (4"x4" or 4" X 2" dial).</li> </ul>			
07	Cut Section of 3 phase squirrel cage induction motor and Alternator.	2 HP, 3-phase, 400v, 50Hz, 1500 rpm, 4-pole Squirrel Cage Induction motor. Alternator: 1KVA/415V/50Hz/1500 rpm	01	Set each	

Yours faithfully,

Date

Place: Signature with Seal of Authorized Signatory