

# NATIONAL INSTITUTE OF TECHNOLOGY KARNATAKA, SURATHKAL

## DEPARTMENT OF MECHANICAL ENGINEERING

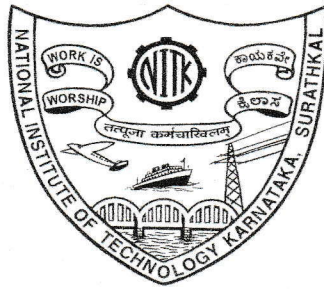
POST SRINIVASNAGAR, MANGALORE – 575 025 (D K)  
A DEEMED UNIVERSITY

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## NOTICE INVITING QUOTATION

Quotation Notification . No. NITK/ME/ 5329/ 2019-20 .....Dated 19/11/2019

**Name of Goods : Multirotor Quadcopter**

**Time for Supply of item : 14.Days.**  
after release of Purchase order

**Last Date for submission of Quotation : 06/12/2019 before 3.00 PM**

**Address for Submission of Quotation :**

**Dr Vasudeva Madav**  
**Assistant Professor**  
**Department of Mechanical Engineering**  
**National Institute of Technology Karnataka**  
**Surathkal**  
**Email: [vasu@nitk.edu.in](mailto:vasu@nitk.edu.in),**  
**Mobile No.: 9008889796**  
**Contact No.: 0824 2473670**



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**NOTICE INVITING QUOTATION (NIQ)**

The National Institute of Technology Karnataka, Surathkal (in short – NITK, Surathkal) is an autonomous body under Ministry of HRD Govt of India, a Deemed University, imparting Technical Education and engaged in Research Activities. It is proposed to procure the items for the departmental academic/research activities.

Sealed Quotations as per the Price Schedule given in this NIQ are invited for the following items subject to the terms and conditions, from the reputed manufacturers or its authorized dealers so as to reach on or before scheduled date and time. The quotations in the firm's Business letter head should be address to the "Director, NITK, Surathkal". The envelope shall be super scribed with the Quotation Notification Number and the Name of the Goods for which quotation is submitted.

**1. Name of Goods : Multirotor Quadcopter**


**(Specifications are annexed to this NIQ)**

**2. Time for completion of Supply after release of Purchase Order : 14 Days**

**3.. Last date at time for submission of quotation : 06/12/2019 before 03:00 PM**

**4. Quotations to be submitted at the following address :**

**Dr Vasudeva Madav**  
**Assistant Professor**  
**Department of Mechanical Engineering**  
**National Institute of Technology Karnataka Surathkal**  
**Email: [vasu@nitk.edu.in](mailto:vasu@nitk.edu.in), Mobile No.: 9008889796**  
**Contact No.: 0824 2473670**

  
**[Signature of HOD with Seal]**

Note: Institute shall not be responsible for any postal delay about non-receipt /non delivery of the bids or due to wrong addressee.

### **Terms and Conditions**

1. The rates should be quoted for preferably FOR destination from supply within India.
2. **In case, Goods are to be Imported, the Indian agent should furnish authorisation certificate by the principles abroad for submission of the bid in response to this Notice Inviting Tender.** In case of import both CIF and/ or FOB rate should be quoted . All components of expenditure to arrive at Bangalore need to be explicitly specified.
- 3 The bidder shall indicate the excise duty exemption for the goods if applicable.
- 3 The institute is eligible for customs duty exemption, excise duty exemption, issuance of form D.
4. The rate quoted should be on unit basis. Taxes and other charges should be quoted separately, considering exemptions if any.
5. Rate quoted should be inclusive of Testing, commissioning and Installation of equipment and Training.
6. Payment: No advance payment will be made. Payment will be made only after the supply of the item in good and satisfactory condition and receipt of performance security by supplier.  
**In case of Imports, the payment will be made through LC / Sight Draft / After Installation, and performance security need to be submitted at the time of LC commitment / issue of sight draft.**
7. Guarantee and Warrantee period should be specified for the complete period conforming to the section 3 of this tender document.
8. Period requirement for the supply and installation of item should be specified conforming to the section 3 of this tender document.
9. In case of dispute, the matter will be subject to Mangalore Jurisdiction only.

## SCHEDULE OF REQUIREMENTS, SPECIFICATIONS AND ALLIED DETAILS

[ To be filled up by the Department / Centre of NITK, Surathkal]

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Item(s) Name to be Procured : **Multirotor Quadcopter**

Brief Specifications of the Item(s)  
(Attach Additional Sheet if necessary) : Attached

Quantity : 02

Any other details / requirement : Nil

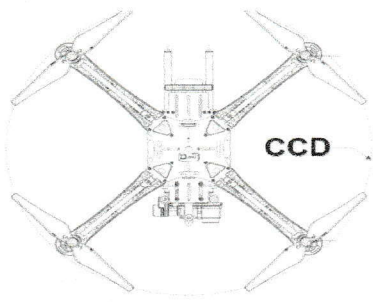
Warranty Period required : One Year

Delivery Schedule expected  
after placement of Purchase order  
(in Weeks) : Two weeks



## Multirotor – Quadcopter Specifications

<b>Goal</b>	<input type="checkbox"/> To build a balanced, well-engineered system which complements our required flying style, the purpose of the drone and the drone size.
<b>Purpose</b>	<ul style="list-style-type: none"> <li>• Design and fabricate a UAV that can reliably support the Air Quality Monitoring system.</li> <li>• To assemble an AQM System capable of recording the desired measurements.</li> <li>• Determine the Air Quality Index at various locations in the surrounding area.</li> </ul>
<b>Drone Type</b>	<ul style="list-style-type: none"> <li>• Multirotor – Quadcopter.</li> <li>• Lower RPM motor and slow flying drone.</li> </ul>
<b>Flying style</b>	<input type="checkbox"/> The quadcopter must be built to haul the AQM monitoring system and should be able to fly vertically at low stable speed to the height approx. 20 meters so that the AQM sensors could sense the gases effectively.
<b>Flight timing</b>	<input type="checkbox"/> Minimum 20 minutes required.
<b>Thrust to weight ratio</b>	<input type="checkbox"/> It should be 2
<b>Payload Weight</b>	<ul style="list-style-type: none"> <li>• 1 kg</li> <li>• Here only the weight of the sensors and controllers in AQM system is considered as payload.</li> </ul> <p>(Drone weights and weight of motors are not considered)</p>
<b>Propeller Type</b>	<input type="checkbox"/> 1045(10×4.5) SF Propellers Black

<b>Propeller C-C Distance</b>	 <p>C-C Distance = Diameter in the figure  Min CCD = 51 cm  Max CCD = 52 cm</p>
<b>Drone Frame Materials</b>	<ul style="list-style-type: none"> <li>• Carbon fibre.</li> <li>• Carbon fibre sandwich structure material is appreciated.</li> </ul>
<b>Motors</b>	<ul style="list-style-type: none"> <li>• Brushless motors should be used.</li> <li>• Motor's KV ratings should be decided by the manufacturer according to the battery used and flight characteristics required( i.e. flight timings and maximum lift in meters )</li> </ul>
<b>Battery</b>	<ul style="list-style-type: none"> <li>• Lipo 3S battery should be used.</li> <li>• mAh of the battery should be selected by manufacturer according to the requirements.</li> </ul> <p>(Select ESC according to the requirement)</p>
<b>Frame</b>	<ul style="list-style-type: none"> <li>• X type quadcopter frame.</li> <li>• Landing gear should be provided.</li> <li>• A bracket to securely affix the AQM Circuit board shall be provided, with min 4 mounting points. The bracket, along with the circuit shall be centrally located above the drone frame.</li> </ul>
<b>Flight Controller</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Pixhawk PX4 Autopilot PIX 2.4.8 32 Bit Flight Controller</li> <li><input type="checkbox"/> It should be configured for <b>auto pilot</b>.</li> <li><input type="checkbox"/> <b>Transmitter and Receiver</b> shall be used accordingly</li> </ul>

# **AQM Circuit Specifications**

## **Introduction**

The primary application of the drone is for air quality measurement. Therefore, an Air Quality Measurement (AQM) circuit is to be fabricated for this purpose. The AQM system must be capable of measuring the concentration (in ppm) of the specified gases accurately and in real-time. Sensor data must be transmitted to the ground station wirelessly while the drone is in flight. The AQM Circuit shall be centrally mounted on the top of the drone frame and shall be made removable for convenience.

The AQM circuit shall have the capability to accurately detect the concentration of the following pollutants (in ppm)

1. Carbon Dioxide (CO<sub>2</sub>)
2. Carbon Monoxide (CO)
3. Ammonia (NH<sub>3</sub>)
4. Methane (CH<sub>4</sub>)
5. Particulate Matter- PM2.5
6. Nitrogen Dioxide (NO<sub>2</sub>)
7. Sulphur Dioxide (SO<sub>2</sub>)

## **Sensors Description**

The sensors used must be of the MQ series (or better) for the toxic gas sensors and DSM501A (or better) for the particulate matter sensor. One sensor must be used for the detection of each pollutant. The sensors shall provide accurate results in the pollutant concentration range of 10-10,000 ppm, and must be calibrated to give accurate results in a coastal climate.

## **Data Collection System Description**

The sensor output shall be fed to a PIC microcontroller (PIC16F877A or equivalent), connected to a GSM Module (SIM800C or equivalent). Since the microcontroller has no internal oscillator, it must be fitted with an external oscillator. (20MHz crystal with necessary capacitors). The microcontroller shall be programmed to transmit sensor data every thirty seconds to the ground station, using the GSM Module. Pre-programming of the microcontroller to convert the sensor data into ppm readings is required. The format of the data transmitted by the GSM module shall be the list of pollutants being measured, along with their corresponding concentration for every time interval. The system shall be powered by an LiPo rechargeable battery, of sufficient capacity to keep the AQM circuit operational for at least 2 hours between charges. SIM Cards necessary for data transmission shall also be provided.

## **Circuit Description**

The AQM circuit shall be completed with necessary wiring, soldering, and insulation between sensors, microcontroller and other components. Minimum length of wires must be used for the purpose, with all



wires being neatly managed using cable ties. Auxiliary components such as capacitors, voltage regulators, etc. are to be added as required. All solders made on the circuit must be non-porous, firmly bonded and use minimum amount of solder metal. The completed circuit shall be affixed to a rigid fibreglass board, whose dimensions must be large enough to accommodate the entire sensor circuit, but small enough to attach to a mounting bracket fitted to the drone. The mounting bracket shall be centrally located above the frame of the drone. Minimum 4 threaded fasteners must be used to affix the fibreglass board to the mounting bracket.

Recommended Specifications for the AQM Circuit are as follows

Sl. No.	Particular	Specification
1	Carbon Dioxide Sensor	MQ135
2	Carbon Monoxide Sensor	MQ7
3	Ammonia Sensor	MQ137
4	Methane Sensor	MQ4
5	Particulate Matter Sensor	DSM501A
6	Nitrogen Dioxide Sensor	MQ135 (Additional to CO <sub>2</sub> sensor)
7	Sulphur Dioxide Sensor	MQ136
8	Microcontroller	PIC16F877A
9	GSM Module	SIM800C
10	External Oscillator Frequency	20MHz
11	Mounting Board Material	Fibreglass
12	Mounting Fastener Type	Threaded
13	Battery Type	LiPo or equivalent
14	Min. Operation Time on Battery	2 hours
15	Capacitors, Voltage Regulators, etc.	As required



## PRICE SCHEDULE

[ To be used by the bidder for submission of the quotation]

- 
- |     |  |   |
|-----|--|---|
| 1.  | Item Name  | : |
| 2.  | Specifications<br>(Conforming to Schedule of requirements<br>Enclose additional sheets if necessary)   | : |
| 3.  | Currency and Unit Price  | : |
| 4.  | Quantity   | : |
| 5.  | Item Cost (Sl No. 3 * Sl. No. 4 )  | : |
| 6.  | Taxes and Other Charges<br>(i) Specify the type of taxes and duties<br>in percentages and also in figures.<br>(ii) Specify Other Charges in figures. | : |
| 7.  | <b>Warranty Period</b><br><b>(Conforming to the Schedule of requirements)</b>  | : |
| 8.  | Delivery Schedule<br>(Conforming to the Schedule of requirements)  | : |
| 9.  | Name and address of the Firm for<br>placing purchase order   | : |
| 10. | Name and address of Indian authorized<br>agent ( in case of imports only)  | : |

**Signature of the Bidder :** \_\_\_\_\_

**Name and Designation :** \_\_\_\_\_

**Business Address :** \_\_\_\_\_

**Place :**

**Date :**

**Seal of the Bidder's Firm**

## CONTRACT FORM

[ To be provided by the bidder in the business letter head]

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1. (Name of the Supplier's Firm) hereby abide by the delivery schedule mentioned in this document for supply of the items if the purchase order is awarded.
2. The item will be supplied conforming to the specifications stated in this document without any defect and deviations.
3. Warranty will be given for the period mentioned in this document and Service will be rendered to the satisfaction of NITK, Surathkal during this period.

**Signature of the Bidder :** \_\_\_\_\_

**Name :** \_\_\_\_\_

**Business Address :** \_\_\_\_\_

\_\_\_\_\_

**Place :**

**Seal of the Bidder's Firm**

**Date :**