

## BOEING National Aeromodelling Competition

This competition is launched with the vision to provide a unified national platform for students interested in aerospace and related engineering disciplines - to demonstrate their aero-modelling expertise.

### **AIM:**

The competition requires the participants to design and fabricate a RC plane (ready-made Planes are not allowed) and perform a set of manoeuvres.

## PROBLEM STATEMENT

### **Design Constraints:**

1.  $T/W < 0.75$  (if excess thrust is found, it will be neutralized by adding weight below the plane at center of gravity).
2. Propeller diameter should not be greater than 10 inches.
3. Battery weight should not be more than 120 gm.
4. Only electrical motors are allowed. The use of IC engines or any other means of providing thrust is prohibited.
5. Use of gyroscopes (gyros) and programming assistance in receivers is prohibited.
6. One of the team members should fly the aircraft and another should call the stunts as they are performed (just before).

### **Abstract Submission:**

1. All the participants need to submit an abstract to [boeing@techfest.org](mailto:boeing@techfest.org) on their aircraft, **with standard formatting** given in point 4. The Abstract must document the basic design of the aircraft (dimensions, wing areas, velocity, etc.) and should also explain how their design is suitable for given problem.
2. Along with the abstract, Participants also have to send a zip file containing at-least 5 and no more than 10 photographs of the aircraft while it is being built.
3. **The Abstract and the zip file has to be submitted by 5<sup>th</sup> December 2017** containing the photographs for teams participating in IIT-Bombay Zonal round have to be sent by email to [boeing@techfest.org](mailto:boeing@techfest.org) with the team details clearly mentioned in the email. The Team ID should be explicitly mentioned in the email subject as well as the filename for both Abstract and zip file.
4. Link for Abstract Format- <http://www.techfest.org/resources/BoeingAbstract.docx>

**Registration Deadline-5<sup>th</sup> December 2017**

## Scope

Evaluation will be carried out in two rounds for the Zonals; a qualifier round and a manoeuvre round. The evaluation criteria and the constraints are listed in the Problem statement. Teams qualifying to the Manoeuvre round in the Zonals will be reimbursed a limited amount for the costs incurred towards the expenses for procuring materials for their models.

## Format of the Competition

The competition requires the participants to design and fabricate a RC Plane (no Readymade Planes are allowed) and perform a set of manoeuvres. Propellers, Motors, ESC, Servos, Receiver and Transmitter are allowed as off-the-shelf items.

The zonal events will be conducted in 4 IITs (East Zone: IIT Kharagpur, West Zone – IIT Bombay, North Zone – IIT Kanpur and South Zone – IIT Madras). Participants can register at any of the four zonal competitions and bring their aircraft and all necessary equipment to participate. The arena will be an open ground. There will be two rounds in the competition.

1. Qualifier Round
2. Manoeuvre Round

### A. Qualifier Round

The best measure of the design of an aircraft can be done by climb and gliding time. In this round, participants are required to make their aircraft to climb for 20 seconds. After this, they need to perform a dead stick flight (throttle=0 or Gliding) and land at a specified location. The plane however can be maneuvered while it is gliding.

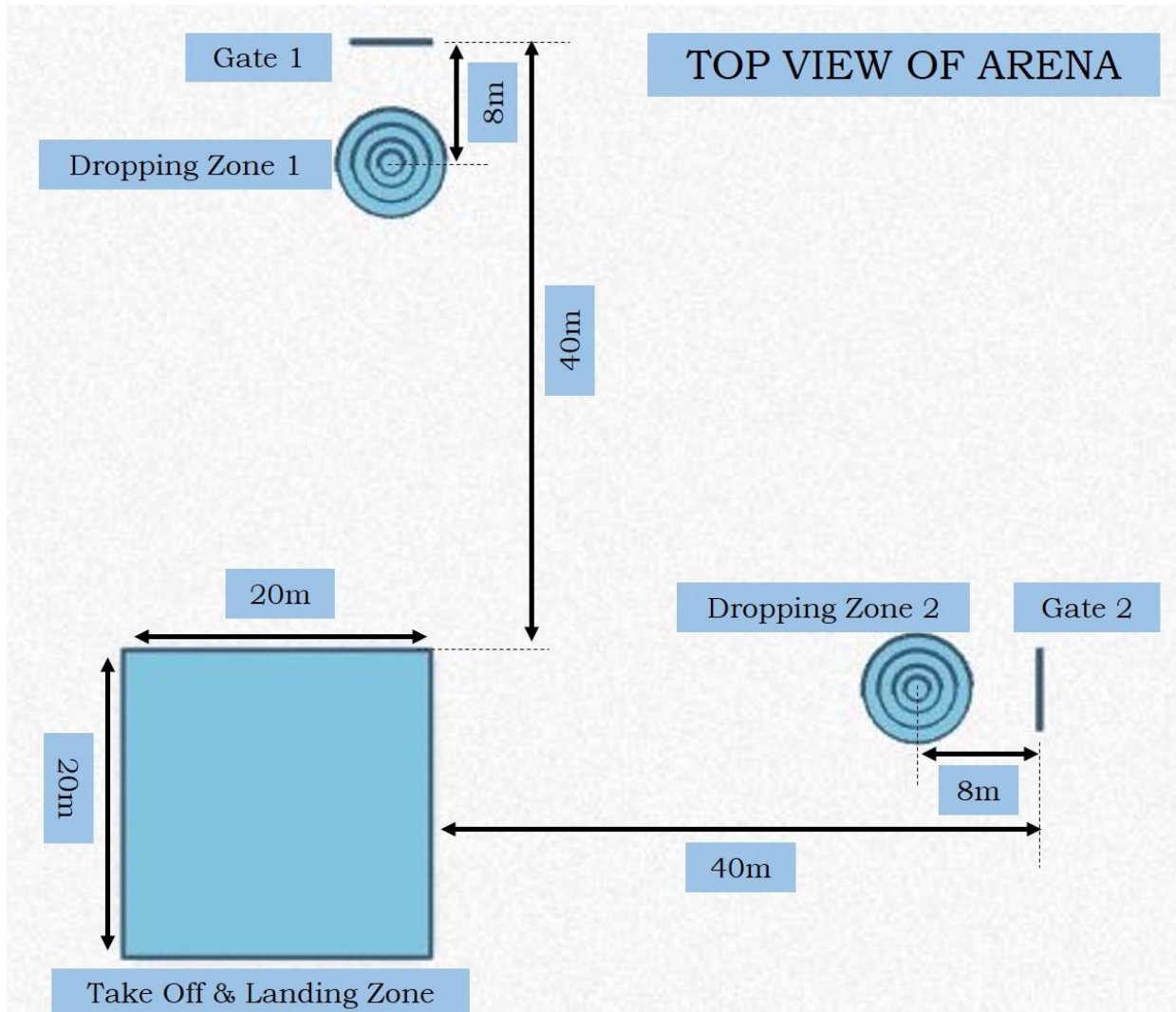
The teams will be graded based on the glide time of the aircraft. A maximum of upto 30 teams, based on the glide time, will qualify to Manoeuvre Round from the Qualifier Round. Along with qualification to next round, qualifying teams will get a reimbursement of INR 5000 per team towards material costs for their models.

The qualifier round is essentially to select a maximum of up to 30 teams based on their performance, who will participate in the Manoeuvre Round. The final winners will be based on the scores in the Manoeuvre round.

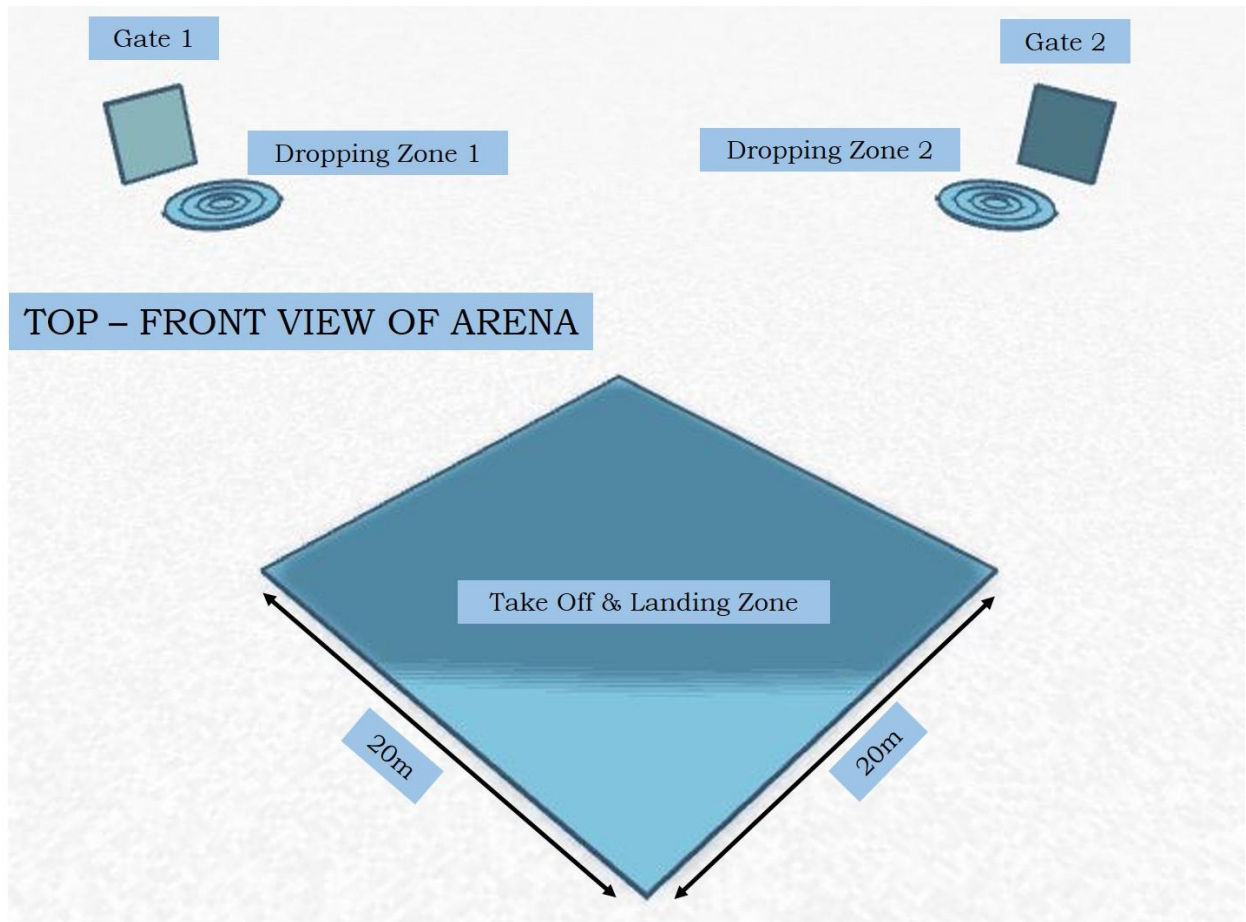
### B. Manoeuvre Round

#### Arena:

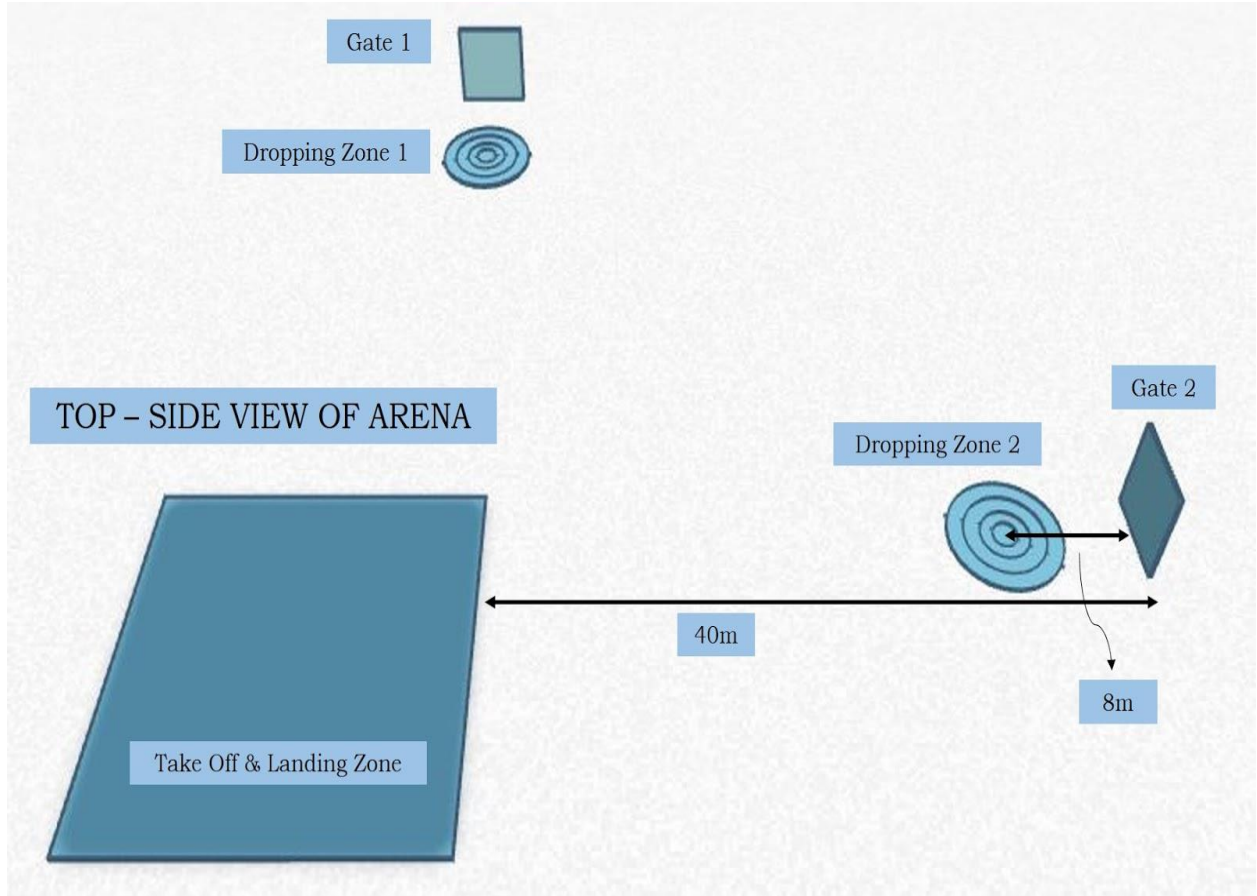
The Arena consists of 2 gates - "Gate 1" and "Gate 2" and 4 concentric circles after each gate that form a target for Object Dropping. Both the gates have a horizontal bar at 5 meters height from the ground. Each gate would have enough space for planes to pass through, yet only the skills of the pilot can guarantee a swift manoeuvre. Both the gates will be at 40 meters from the Take Off / Landing Zone and are symmetrically positioned from the Take Off/Landing Zone. (For a better understanding of the arena, refer to the illustrations below).



**Fig. 1**



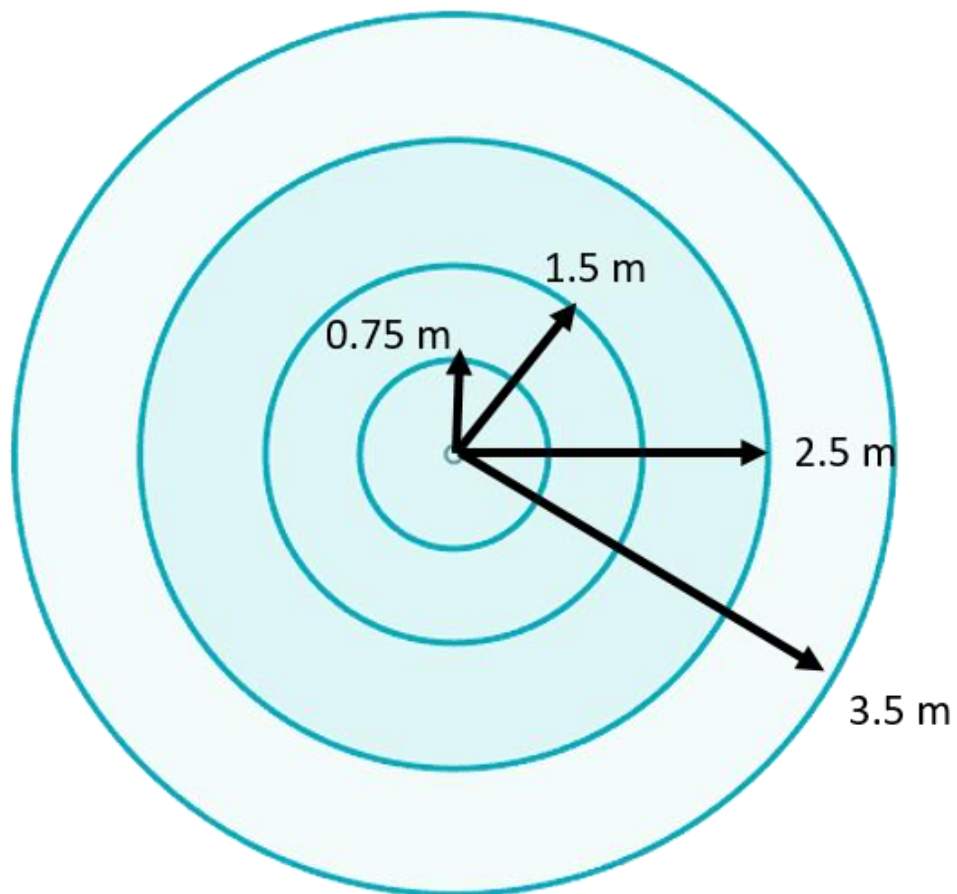
**Fig. 2**



**Fig. 3**



## OBJECT DROPPING ZONE



**Fig. 4**

**Steps of the Manoeuvre:**

Step 1	Take Off from Take Off Zone	Mandatory
Step 2	Passing through Gate 1 (or Gate 2)	100 points
Step 3	Passing through Gate 2 (or Gate 1)	300 points
Step 4	Dropping Object in Dropping Zone 2 (or Dropping Zone 1)	Points according to table below
Step 5	Landing in Landing Zone	100 points

Points for Object Dropping will be awarded according to the following table.

a	Innermost circle of diameter 1.5m	1000 points
b	Second circle of diameter 3m	700 points
c	Third circle of diameter 5m	500 points
d	Fourth circle of diameter 7m	400 points
e	Outside fourth circle of diameter 7m	300 points

A maximum time of 4 minutes will be given between the first take off and the final landing. Any further instructions would be given before the competition, on the spot.

### Scoring Guidelines for Manoeuvre Round

1. The team should keep attempting the manoeuvre until they complete all steps in that order in one attempt without landing.
2. After completing all steps mentioned in the manoeuvre, teams are eligible to score additional points as mentioned below.
3. The following guidelines should be followed for additional points:
  1. The teams can attempt the same manoeuvre multiple times within the time limit
  2. For each attempt, partial step-wise points will be awarded i.e. if the team completes steps 1&2, they get points for 1&2 and so on
  3. The steps have to be performed only in the given order. No points will be awarded for steps done in incorrect order. For example, if a plane does steps 1&3 without doing 2, points for step 1 will only be awarded.
  4. It is mandatory for the team to land before attempting the manoeuvre again. Landing can happen outside landing zone but will not be awarded any points.
  5. The participant has to place the object in/on the plane for the subsequent manoeuvre before taking off
  6. A number of similarly shaped and sized objects will be kept in the take-off zone for subsequent object dropping manoeuvres
  7. The plane should NOT carry more than one object for each manoeuvre

If there is a tie, winner will be decided by a separate round framed by the Judges on the spot. **Judges' decisions would be considered final in all cases.**

### General Guidelines for Manoeuvre Round

1. The plane has to carry a dead mass of dimension 2cm X 2cm X 2cm and weighing less than 50 grams
2. As both the gates are placed symmetrically, the pilot can choose either of the gate as the entry gate to perform the manoeuvres, but he/she has to call out his gate of choice soon after take-off
3. The other gate automatically becomes the exit gate and the object should be dropped in the corresponding Dropping Zone
4. The Pilot will try to drop the dead weight in innermost circle of 4 concentric circles drawn on the ground.
5. The pilot is allowed to change his choice of entry gate while in flight, but he/she has to call out the same and any stages performed prior to the change of entry gate will be considered void
6. The location of the dropping area w.r.t the gates and the gates w.r.t the take-off/landing zone is shown in the arena illustration



### **Rules on Team structure:**

1. Maximum of 4 members in a team.
2. Members of a team may be from same college/school or different (K-12/UG/PG).
3. Any number of teams can participate from one college/school
4. Professionals are not allowed. Only students can participate.
5. Participants are required to get a bona fide certificate signed by the respective HoD/Dean/Principal in addition to their school/college ID Card.

### **General Rules:**

1. Each team would be given 2 chances for each of the rounds and the best score is considered as per the scoring procedure mentioned above for each round.
2. The timer will start from the moment the aircraft is in the air for both the rounds.
3. Awards will be announced based on the performance of the teams in the Manoeuvre Round.

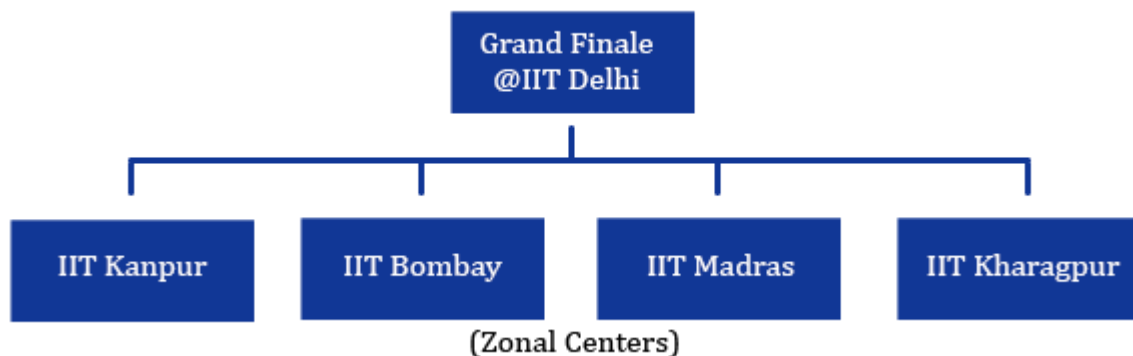
### **Revisions**

Any revisions to the Scope of the Competition would be intimated to all the participants via registered email and on the websites of the respective festivals at-least 45 days before the event takes place.

### **General Guidelines for the Competition**

1. The use of 2.4 GHz radio is required for all aircraft competing in the competition. If the participants want to use any other frequency, they will have to inform the organizers in advance.
2. A limited number of 2.4 GHz radios will be available with the organizers for use by the teams. Teams who do not have access to radios can inform the organizers in advance to request use of these radios.
3. Receivers installed in the aircraft have to be in 'receiver mode only'.
4. All the systems (Servos, motor, etc.) will be checked by organizers for functionality before the competition. If found not working, teams will be dismissed from the competition.
5. Pilot can position himself at any point in the arena to fly the aircraft during the rounds.
6. **Metal propellers are not allowed.**
7. The models can have powered take-off with a landing gear or can be launched manually by a person standing at ground level.
8. Plane should be built from scratch and not purchased models.
9. A team member can't be a part of more than one team.
10. Teams can participate in more than one zonal event if they are not qualified for the finals already

11. Teams that claimed reimbursement in one zonal event cannot claim in any other zonal event in case they are participating in more than one zonal event.
12. New members cannot be added to the teams who have been selected at Zonals to reach the Final Round.
13. Bring your college/student I-Card at the time of competition.
14. Any of the above mentioned rules, if found violated, teams would not be allowed to participate in the competition.
15. **Decision Taken by Judges and Organizers will be final and binding for all.**



### This would be a two-staged pan India Competition:

- Zonal Level: The Zonals would be held in conjunction with the Technical Festivals of IIT Bombay, IIT Kanpur, IIT Kharagpur and IIT Madras. The First three teams from each of the Zonal competitions, a total of 12 teams from the Zonal competitions, will participate in the National level.
- National Level: The National Level Competition will be held at IIT Delhi for all the toppers from the Zonal Round to decide the champion.

### CERTIFICATE POLICY:

- Top three teams in the grand finale will be awarded Certificate of Excellence.
- E-Certificate of participation will be given to the teams scoring more than the critical marks which will be decided later.

**Prizes:**

The Prize money will be awarded to Winners via NEFT and will be processed within 20 working days after the receiving the Prize Money from Sponsors.

The Winner have to mail the following information (immediately after announcement of results) to [prithviraj@techfest.org](mailto:prithviraj@techfest.org).

Subject: Compi Name, team id- your position (example- Vise Clutch, VI1003- 3<sup>rd</sup> Position)

Body of mail-

- 1.Account Holder's Name
- 2.Account Number
- 3.Bank name and Branch name.
- 4.IFSC Code