



Indian Institute of Technology Guwahati

and

Techniche
The Annual Techno-Management Festival
1st - 4th September 2011

present



The International School Championship

TECHNO+HLON

Inspiring Young Minds.....

HAUTS SQUAD

Duration: 2 Hours

Maximum Marks: 151

TEAM DETAILS

Names of Participants:

1. Shubham Goyal
2. Ayush Shah

Team Registration No: _____

Name of School: _____

State: Haryana

City: Gurgaon

General Instructions

Please read the following very carefully before attempting the paper. Failure to do so could cost you dearly.

1. Candidates must fill the Team Details in the space provided, before starting to attempt the paper.
2. All answers must be written in the space provided at the end of this booklet which has to be submitted at the end of the examination. The Question paper can be taken back home.
3. All answers must be clear and legible. In case of any ambiguity, the decision of the evaluator is final.
4. All questions are correct and no queries will be entertained during the examination.
5. All those teams who have not paid their registration fee must submit it to the invigilators before signing the attendance booklet.
6. No additional sheets will be provided for rough work.
7. Blank papers, clipboards, log tables, slide rulers, calculators, cellular phones, pagers and any other electronic gadgets are NOT allowed.
8. This question paper contains 20 pages and 26 questions.
9. The medium for answering this Paper is English. Answers in any other Language will not be accepted.
10. The maximum marks for this paper is 151.

DISCLAIMER: In any case of any discrepancy, the decision of the Organizers will be deemed final and no further correspondence will be entertained.

Marking Scheme

The following marking schemes will be used for evaluating various questions throughout the paper:

1. PLAIN MARKING SCHEME

This is the standard marking scheme for a section! In the Plain Marking scheme, the total marks you score in a section is a multiple of the number of correct answers you gave in that section.

2. GEOMETRIC MARKING SCHEME

This scheme guarantees bonus marks for more correct answers! In the Geometric Marking scheme, the total marks you score in a section increases exponentially with every correct answer you provide!

3. FIBONACCI MARKING SCHEME

The Fibonacci Marking scheme rewards consistency in answering questions of a section correctly!

If 'n' is the number of questions you answered correctly in the section, then your score would be, a multiple of the 'n+1'th term in the Fibonacci Sequence defined by 1,1,2,3,5,8,13...

4. EULER MARKING SCHEME ($F+V-E=2$)

As the marking scheme for the (Funbit) section, the Euler scheme packs many surprises! You have to clearly plan the number of questions in this section that you must answer - because, there are bonus marks for answering a certain number of questions! Answering more questions might get you a lower score!!

This marking scheme is based on Euler's equation,

$$F - E + V = 2$$

but with a twist! The E, V and F used above have different meanings, as defined below:

E: The number of questions you correctly answer in the section

V: The number of VOWELS in the English spelling of "(E+8)"!

and F = One-third of the marks you will be awarded in that section!

Maybe, that was confusing. We can understand better with the help of an example. Supposing, you answered 8 (EIGHT) questions in that section. Then,

$$E = 8$$

$$V = \text{No. of vowels in "(8+8)" = number of vowels in "16"}$$

$$= \text{No. of vowels in "SIXTEEN"} = 3 \text{ (I, E and E)}$$

Then,

$$F - 8 + 3 = 2$$

$$\text{Hence, } F = 2 + 8 - 3 = 7$$

Since F = One-third of the marks you will be awarded in that section = 7,

the marks you will be awarded in that section = $3 \times 7 = 21$.

Hence, if you answer 8 questions correctly in the section, according to the Euler scheme, you will score 21 marks in that section!

5. MOMENTUM MARKING SCHEME

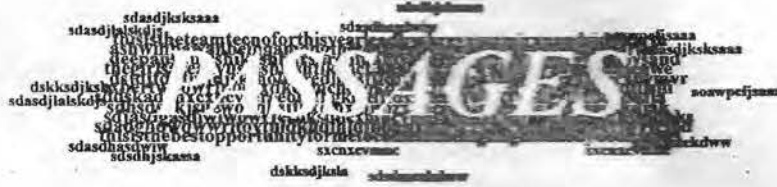
In the Momentum marking scheme, a base score of 2 is awarded for a correct answer.

For each correct answer in succession, you will be awarded '1+' (the no. of marks awarded for the previous correct answer). However, if you break the momentum (by not answering a question, or answering it wrongly), the score awarded to a correct answer resets to 2 (the base score)!

To clarify this scheme, consider this example:

If you correctly answered the first question, you score 2 marks for it. Also, if you correctly answered the 2nd and 3rd questions, you score 3 and 4 marks, respectively, for the question. Supposing you did not answer the 4th question (or answered it wrongly) - so, you won't be awarded any marks for it. After that, if you answered the 5th question correctly, you will score 2 marks for it, and so on.

- No marks will be awarded for a section with no questions correctly answered.
- There is NO negative marking for any section.



Super Mario 64

(Geometric Marking Scheme - $2 \cdot 3^N$
N is the no of correct answers.)

Once again, Mario is on a quest to save Princess Peach!

Mario enters Peach's castle and finds himself in a room with four doors to choose from. This room is the first in a sequence of 'n' distinct rooms. In each room, only one door correctly leads to the next room in the sequence (or for the last room, into BOWSER'S level) - whereas, the other three doors lead back to the first room. But, there is a catch! Bowser has planted 'Amnesia power-ups' to make the Mario's rescue harder! If Mario selects a wrong door, he forgets all his choices except for those of the last correct room that he reached in the sequence! Now, assuming that there are 4 rooms to choose from besides the entrance to each room, and that Mario is rational, answer the following questions -

1. If $n = 2$, what is the maximum number of doors that Mario would have to pass through before he reaches Bowser's level (not counting Mario's initial entrance to the first room)?
(A) 23 (B) 28
(C) 20 (D) 25
2. If $n = 6$, what is the maximum number of doors that Mario would have to pass through before he reaches Bowser's level (not counting Mario's initial entrance to the first room)?
(A) 5469 (B) 5460
(C) 5451 (D) 5468

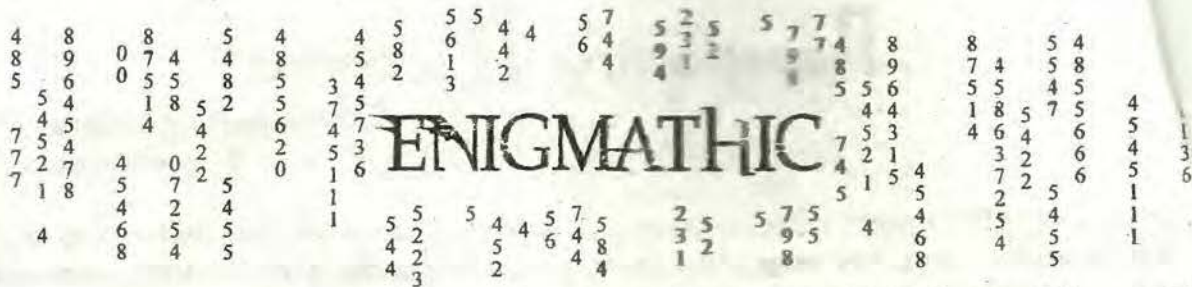


Questioning Questions

(Geometric Marking Scheme - $3 \cdot 2^N$
N is the no of correct answers.)

When we refer to "the correct answer to Question X" it is the actual answer, not the letter, to which we refer. When we refer to "the letter of the correct answer to question X" it is the letter contained in parenthesis that proceeds the answer to which we refer. You are given the following condition :
No two correct answers to questions on the test may have the same letter.

1. If a fourth question were added to this test, and if the letter of its correct answer were (C), then -
 - (A) This test would have no logically possible set of answers.
 - (B) This test would have one logically possible set of answers.
 - (C) This test would have more than one logically possible set of answers.
 - (D) This test would have more than one logically possible set of answers.
 2. If the answer to Question 2 were "Letter (D)" and if Question 1 were not on this multiple choice test (still keeping Questions 2 and 3 on the test), then the letter of the answer to Question 3 would be :
 - (A) Letter (B)
 - (B) Letter (C)
 - (C) Letter (D)
 - (D) Letter (A)
 3. Let $P_1 = 1$. Let $P_2 = 3$. For all $i > 2$, define $P_i = P_{i-1} \cdot P_{i-2} - P_{i-3}$. Which is a factor of P_{2002} ?
 - (A) 3
 - (B) 4
 - (C) 7
 - (D) 9
-



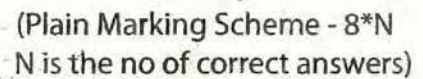
(Fibonacci Marking Scheme - $4 \times \text{fibonacci}(N+1)$
N is the no of correct answers.)

1. Sudeep was travelling in train one night. It was **late**, but he was not sleepy. A maths professor was sitting opposite him, and they **had been chatting** for a while. Few minutes back, the professor had questioned, "There are **three** men. Can you tell me their ages if I tell you that they **are together** as old as you are, and that the product of their ages is 2450?" After **thinking hard** for some time, Sudeep had replied, "No, it is not possible." The professor **replied**, "of course it isn't. I know. But let me tell you, if I tell you that I am **younger than** the oldest of the men, you shall be able to find out their ages as well as mine."
What is the professors age ?
2. The numbers 112, 121, 123, 153, 243, 313 and 322 are among the rows, columns and diagonals of a 3×3 square grid of digits (rows and diagonals read left-to-right and columns read top-to-bottom). What 3-digit number completes the list ?
3. A positive integer n is called "**FLIPPANT**" if n does not end in 0 (when written in decimal notation) and, moreover, n and the number obtained by reversing the digits of n are both divisible by 7. How many **FLIPPANT** integers are there between 10 and 1000 ?
4. Sreenivas decides to buy a nice horse. He pays ₹600 for it, and he is very content with this strong animal. After a year, the value of the horse has increased to ₹700 and he decides to sell the horse. But, already a few days later he **regrets** his decision to sell the beautiful horse, and he buys it again. Unfortunately, he has to pay ₹800 to get it back, so he loses ₹100. After another year of owning the horse, he finally decides to sell the horse for ₹900. What is the overall profit or lose Sreenivas makes ?
5. Arko has many boxes of seven different sizes. The boxes are occupying too much space of his room and he wants to pack them **all up neatly**. He has **12 boxes of the largest size**. In **some of these 12 boxes**, he keeps **8 boxes EACH**, of the second largest size, and leaves the rest empty. In **some of these boxes of second largest size**, he keeps **8 boxes EACH**, of the **third largest size** and leaves the rest empty... and so on untill he places **8 boxes each of the smallest size** in some boxes of the second smallest size, leaving the rest empty. Clearly, all boxes of smallest size are empty. In the end, he calculates that he has **292 empty boxes**.
How many boxes does Arko have ?

14
21
28
35
42
49
56
63

71
4





(Write the location of the boxes you land, in the proper order of movements as your answer.)

3360

~~750~~
70
~~300~~
750
~~750~~
750
750
750
750
750 - I
W - (750)
R - (1450)
G - (1300)

~~70~~
-300
1500
+500
900

1750
30
300
900 - 300
3500
3690
700
+1800
2350
-6



FUNBIT



(Euler Marking Scheme)

1. One morning Deepanshu is leaving on business trip and finds he left some paperwork at his office. He runs into his office to get it and the night watchman stops him and says, "Sir, don't get on the plane. I had a dream last night that the plane crashes and everyone dies!". Deepanshu takes his word and cancels his trip. Sure enough the plane crashes and everyone dies. The next morning Deepanshu gives the watchman a ₹ 1,000 reward for saving his life and then fires him. Why did he fire the watchman who saved his life?

2. ~~It's always 1 to 6, its always 15 to 20, its always 5, but it's never 21, unless it's flying.~~
What is this?

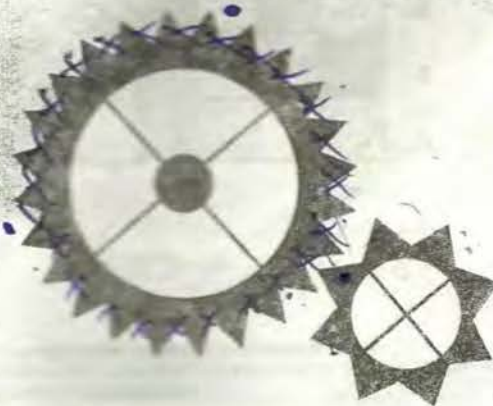
3. A computer program is a function that takes in 4 bits for input, where each bit is either 0 or 1, and the outputs TRUE or FALSE. How many computer programs are there?

4. Three men, Mr. Red, Mr. Blue and Mr. Green were having tea together. One of them was wearing a red sweater, another was wearing a blue one and the third man was wearing a green sweater. The man with the blue sweater says - "How strange it is that none of us is wearing a sweater of the same colour as our name."
Mr Red replies, "Yes. That's certainly true!"
Who is wearing what coloured sweater?

5. A cog wheel with 8 teeth is coupled with a cog wheel of 24 teeth which is fixed. How many rotations will the small cog wheel have made when it circles the bigger one once?

(A) 3
(C) 4

(B) 3.5
(D) 2



Aayushi went to the computer centre to register for Technothon but could not log in to the computer terminal successfully. Her password didn't work despite trying twice. She suddenly remembered that the passwords are reset every month for security purposes. So she called the technician and said,

Aayushi: "Hello sir, can you help me? I cannot login to the computer terminal. My password was invalid!"

Technician: "Yes, that's right. The password has changed and is different. I am sure, you can figure out the new one. Your new password has two letters more than your old password and only three of the letters are the same."

Aayushi: "Thanks sir."



With that Aayushi could correctly login to the terminal without any trouble. Can you tell what her passwords were (both old and new)?

7. This odd little puzzle occurred the other day at an archery meeting. Rishikesh, who carried off the first prize scored exactly one hundred points. Can you figure out how many arrows he must have used to accomplish the feat?



$$\begin{array}{r} 34 \\ 16 \\ \hline 50 \end{array}$$

$$\begin{array}{r} 34 \\ 32 \\ \hline 78 \end{array}$$

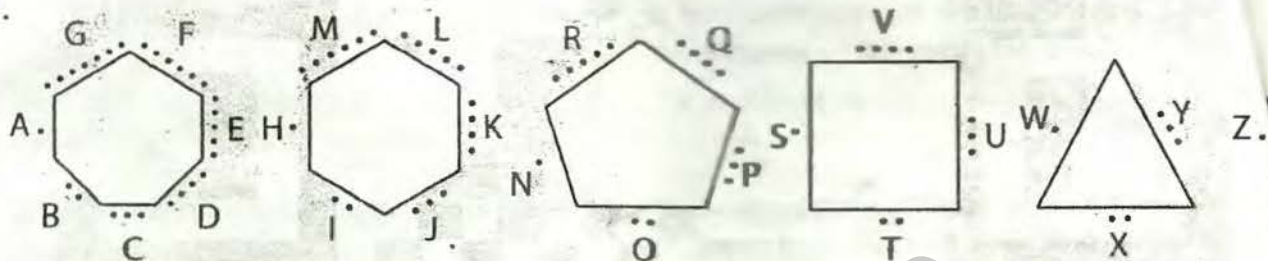
ESD

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

(Momentum Marking)

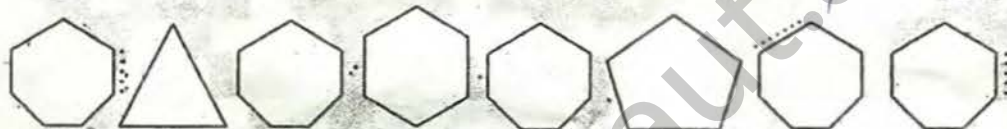
(Momentum Marking Sche

1.

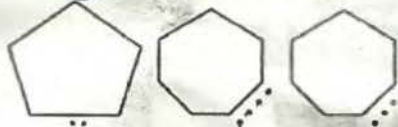


Decipher the code given below.

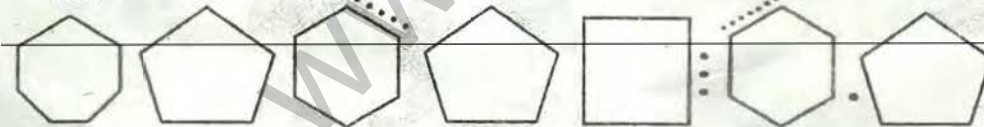
E X C H A N G E



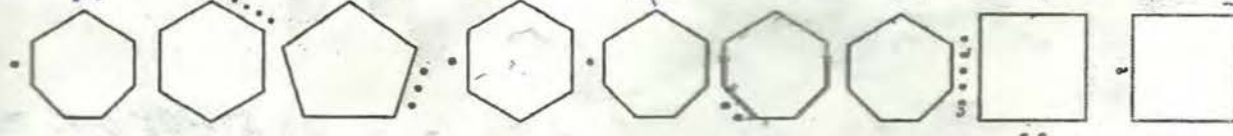
0 0 0



C O L O U R I N



A L P ~~CH~~ A B E T S


$$3 + 4 + 54$$

2. ~~SEAFINT ERSMEICE LIFE NNT JONDS~~
~~RTAR IEGTFO RHM AETTREADEWED~~

(Hint - Including space)

READ - ~~THE~~ LETTERS
 - FROM - ALTERNATE
 - ENDS - Starting
 from - THE - Left -

3. ~~hahyveihwv lapoka elcsea pti ipoptseogm kseede~~

Read reverse fill in owels

4. DIMARYP ht n wlb yltcrd rtll htw clpr

at appropriate word.

~~ate~~ space places

Replace with
 letter directly
 below in the
 pyramid.



unjumble

5. m@me\$da - cfl? lq?

6. Inventing life on a cobra.

(Hint: techniche speaks)

In ~~to~~ ~~two~~
 T

celebrating innovation

PUZZLES



(Geometric Marking Scheme - 3*4
N is the no of correct answers.)

Battle ships

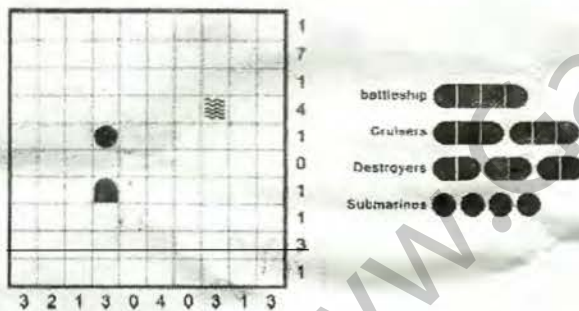
Welcome on board, Captain!

A Battleships puzzle represents an ocean with a hidden **fleet of ships**. The objective is to discover where all ships are located!

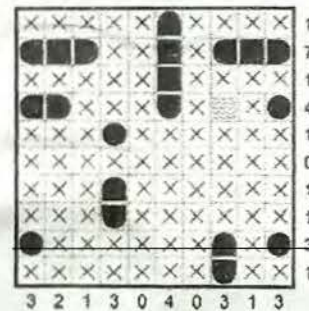
These ships may be oriented horizontally or vertically **within the grid** such that:

1. No ship touches another, not even diagonally.
2. The numbers on the right and on the bottom of the **grid** show how many squares in the corresponding row and column are occupied by ship segments.

Example



Solution



Solve:



SHIPS TO BE UNCOVERED:



SKYSCRAPERS

Skyscrapers!

Imagine yourself to be in a city of towering skyscrapers.

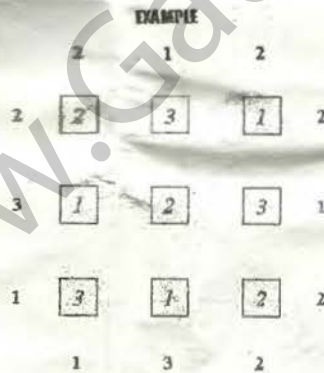
Suppose that you want to find out the arrangement of skyscrapers in a part of the city. This part of the city is represented by a grid such as the one shown below:

To determine the arrangement, you must follow these rules:

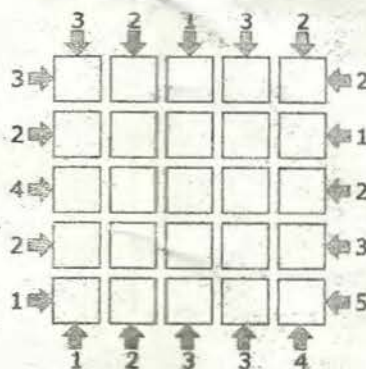
1. Every square contains a skyscraper (of height 1, 2, 3 or 4).
2. Complete the grid such that every row and every column contains the numbers 1, 2, 3 and 4.
3. In a row (or column), no repeating skyscraper number occurs.
4. The numbers around the grid tell you how many skyscrapers you can see from that point along up/down or left/right directions.
5. You can't see a **shorter** skyscraper behind a taller one.

What are the numbers around the edges?

Imagine standing around the edge; these numbers tell you how many skyscrapers you can see. (You might be able to see any number from 1 up to 4.)



Solve:



Hashi

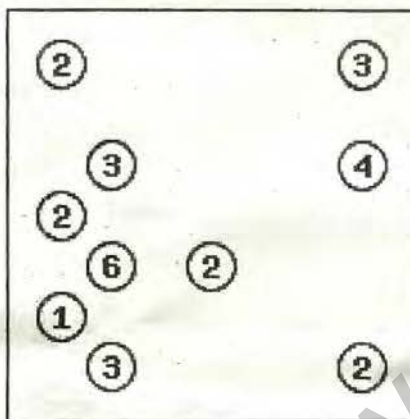
Let us now explore a wild archipelago.

A Hashi puzzle is based on a rectangular arrangement of islands (which are each denoted by a circle). The number in each island tells how many bridges are connected to it. Your objective in this puzzle is to connect all islands according to the number of bridges!

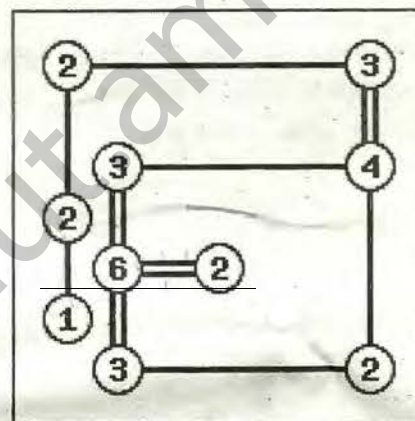
However, you must ensure that

1. There are no more than two bridges connecting two islands, and
2. There is a continuous path connecting all islands together.
3. Bridges can only be vertical or horizontal and are not allowed to cross islands or other bridges.

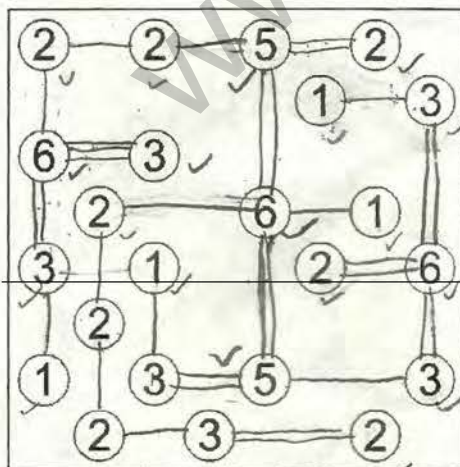
EXAMPLE



SOLUTION



Solve:



A word from the Organisers of Technothon 2011

The question paper

As our team sat together to prepare the question paper that you attempted during the course of the last two hours, a few thoughts often crossed our minds:

'Is the paper too tough? Will the students be able to enjoy it? Should we make it easier?'

Well, we contemplated long and hard on this, and the answer we came up with was:

The paper has been designed such that you've got to be awesome to solve all of the questions within the stipulated time. We stressed on this fact during our team's meetings. Our intention was to select the best and the brightest minds from across the country, through a paper that would uniformly inspire all young minds that wrote it.

The preliminary round of Technothon 2011, in our opinion, comes close to testing the mental prowess that a student requires to become a world leader. Most definitely, it is wonderful to clear the preliminary round. However - don't be disheartened if you don't manage to clear it!

"Success is not final, and failure is not fatal. It's the courage to continue that counts.", as Winston Churchill famously put it. We hope that you will positively take up the challenge of returning here next year and attempt to clear what is arguably, one of the most competitive examinations conducted for school students in India.

On a side note, you might have noticed that the question paper was peppered with names of various people. We would like to point out that these are the names of members of Team Technothon who were involved with the preparation of the Question paper. They've spent long hours in building from scratch a question paper that students all over the nation could solve, and as you might probably agree, they have done a pretty good job! We really do hope that you had as good a time solving the questions as we did while preparing them!

Indian Institute of Technology Guwahati

Presenting the body that brought Technothon 2011 to you - IIT Guwahati! Established in 1994 as the sixth member of the IIT Fraternity, IIT Guwahati is one of the premier institutions for engineering, science and technology in the country. IIT Guwahati functions completely in a state-of-the-art and generously endowed campus both in infrastructure and natural beauty. Spread across 700 acres with the majestic Brahmaputra on one side, and hillocks and lakes on the other, this campus with its natural beauty provides an ideal setting for learning and innovation. We, as IITians, strive for excellence in all walks of life. Because, excellence and innovation are two words that aptly define the 3000-odd students who live on this campus.

Techniche

Techniche is the annual **techno-management festival** of IIT Guwahati. Every year, the IIT-G student community organises **Techniche** which draws an **immense** participation from around the world. Techniche is conducted **with a vision** to foster the **spirit** of science and technology among the youth of India and has **successfully completed** 11 editions. **Eminent** personalities, Nobel laureates, and world leaders have graced **the stage** during Techniche in its **past** editions. With 'Celebrating Innovation' as the tag line for the **coming-up 2011** edition of Techniche, you just know that the techno-management extravaganza is **going to** get much bigger. Technothlon – The International School Championship is the module of Techniche devoted exclusively to school students across India!

An open invitation for a lifelong association with Technothlon

Before you feel like you have reached the end of a sensation, we should remind you that this is merely the beginning! The Technothlon community has been growing at a phenomenal rate, and we invite YOU, the future leaders of the country, to be a part of it. Regardless of whether you make it through to the final round or not, we cherish the opportunity to interact with every one of you. Facebook, Twitter, Wordpress and Flickr are our means of reaching out to the student community - Be connected, stay updated!

We are eager to help through counseling of any kind required in any sphere by utilizing the experienced pool of IITians and highly qualified faculty of IIT Guwahati. And finally, we would be glad to receive any constructive feedback about the question-paper or any general issue that you would like to discuss with us. After all, your feedback is what Technothlon thrives on for improvement.

Chief Organising Team

Shreyas H. Nangalia
Siddhartha Nambiar

Anand Kulkarni
Ashwin TK

Samir Noorani
K Pavan Chandra

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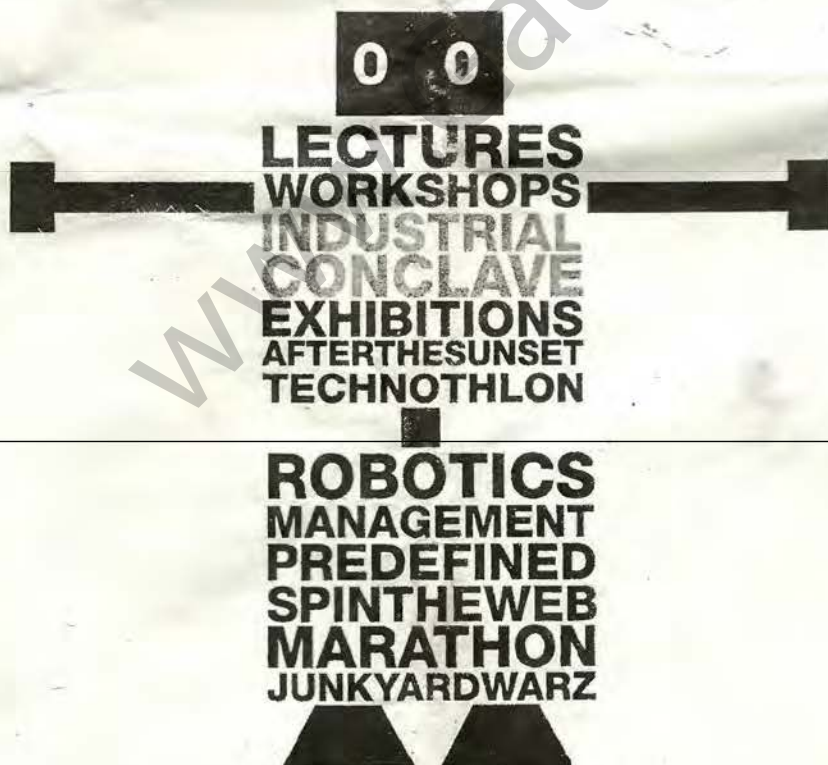
12
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celebrating
innovation

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