

Indian Institute of Technology
Guwahati

Techniche 
The Annual Techno-Management Festival

presents

Associate title sponsor



Technothlon

the international school championship

.....Inspiring Young minds!

Junior Squad

Team Details

Name of the participants:



1. _____

2. _____

Roll Number: _____

School Name: _____

Time: 2hrs 30min
Maximum Marks : 106
Minimum Marks : -33

Please read the instructions carefully

General Instructions

1. Fill in the Team Details in the space provided, before starting to attempt the paper.
2. Verify that the question paper contains 24 pages and 25 Questions.
3. All answers must be written in the OMR provided separately which has to be submitted at the end of the examination. The Question Paper can be taken back home.
4. All answers must be clear and legible. In case of any ambiguity, the decision of evaluator is final.
5. No queries regarding the correctness of the questions shall be entertained.
6. Blank papers, clipboards, log tables, slide rulers, calculators, cellular phones, pagers and any other electronic gadgets are not allowed. No additional sheets will be provided for rough work.

Selection Criteria and Result

1. The ranking will be based on the total marks obtained in all the sections.
2. The result will be declared on or before August 11, 2014 on our website techniche.org/technothlon. To check your result, login with your roll number.
3. The top 50 teams will be invited to IIT Guwahati for the Mains and will be awarded Gold certificates. The next 200 will be awarded Silver certificates.

OMR instructions

1. DO NOT TAMPER WITH THE OMR.
2. Darken the bubbles properly by **BLACK** ball point pen only.
3. Fill all the details in the OMR sheet properly.
4. Follow the correct method as shown in the figure to fill in the OMR Sheet.

Wrong Methods				
1	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>	<input type="radio"/>
3	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>
4	<input type="radio"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="radio"/>

Correct Method				
1	<input type="radio"/>	<input type="radio"/>	<input checked="" type="checkbox"/>	<input type="radio"/>

Please read the instructions carefully

Question paper format

1. There are 23 single answer type objective questions. You need to bubble the correct option in the OMR.
2. There are 2 integer type questions where you need to bubble the correct digit in the OMR.

Marking Scheme

Climb and fall scheme – for Puzzles section

This scheme consists of 6 types of marking schemes. You start with the type 1 marking scheme. As and when you answer the question correctly, you automatically move on to the type 2 marking scheme and so on. However, if you break the sequence and attempt the question wrongly, you again start from the type 1 sequence and move henceforth.

Type 1: (+2,0)

Type 2: (+3,-1)

Type 3: (+4,-2)

Type 4: (+5,-3)

Remaining sections

What if you get to decide the marking scheme of other sections yourself. So, here you have 2 marking schemes in hand. Go ahead with the one which you like the most.

Type 1: (+2.5,0)

Type 2: (+4,-1)

Note:--(+x,-y) represents x marks will be awarded for correct answer and y marks will be deducted for wrong answer.

Betting – not for all the sections

Ever tried your luck at betting. How confident are you about your answers? Bet them. If correct, you get an additional 20% of the points you scored in that section. But, if you go wrong, your score gets reduced by 30%(i.e 30% of maximum marks that can be obtained in that section). Keep in mind, betting is not at all a compulsion. However, if you won't have confidence on your answers, who do you think will? So, buck up young minds and bet in as many sections as you can. Betting will fetch you marks if all the question in that section are correct.

Note:-In case of anomaly in any question, you will be awarded the maximum possible marks for it. Choose the betting option and Marking scheme in the space provided in the OMR sheet.

Hangman



It is a leisure period in Rohit's school and he decides to play the word-guessing game, HANGMAN, with his friend Revanth.

The rules of the game are:

- Rohit thinks of a word and tells Revanth the number of letters in the word.
- Revanth has to guess the letters in the word.
- At most, Revanth can guess incorrectly 7 times.
- If he guesses all the letters before getting 7 incorrect guesses, Revanth wins.
- Otherwise, Rohit wins.

Rohit thinks of an 8-letter word. He further gives Revanth a hint as: "If you guess correctly every time, you can win the game with 6 guesses."

Revanth starts guessing alphabetically but loses. Among all his guesses, he could get only 2 guesses correct, 1 vowel and 1 consonant.

Question 1

Which of these vowels is definitely NOT present in the word?

- (A) A (B) E (C) I (D) O

Rohit plays the same game with another friend Vasavi, thinking of the same word again. Vasavi's strategy is that she guesses all the vowels first and then the consonants, alphabetically. However, she loses and her last incorrect guess was G.

Question 2

The number of distinct vowels and consonants in the word are, respectively –

- (A) 1,5 (B) 2,4 (C) 3,3 (D) 3,4

Question 3

The following are pairs of words in which the first word CAN and the second CANNOT be the word to be guessed. Based on your observation of the games, which of these is the only correct pair?

- (A) CARPETED ; ACTUALLY
(B) TERMINUS ; CHARCOAL
(C) OVERDOSE ; REOPENED
(D) REOPENED ; CHARCOAL



coded and folded

There are 7 folders in a drive. Each folder has a certain number of sub-folders in it. The names of the folders have been coded according to some rules. Each folder has a single word name. The coding has been done such that each letter has been replaced by a unique letter or number according to the code.

The coded names of the folders are:

ZORZ
ZIZYRZ
HSIR1K
OV1LM
ZH1Z
JFZIP
YLHLM

The names of the folders have a relation with the number of subfolders in it as follows (the rules are placed according to decreasing order of priority. If two rules clash for a folder the rule mentioned with higher priority will hold). They are

- Each folder whose name starts with A and ends with A has four sub folders in it.
- Every folder has at least two subfolders in it.
- The number of subfolders in a folder with a name five letters long has to be equal to its position among the folders when arranged alphabetically. (position from top)
- The folder with a name that consists of odd number of letters has the least numbers of subfolders possible.
- If any folder is still left, the number of subfolders in it will be equal to the number of folders left for this step.

In order to crack the code, some random words and their coded versions have been given. Crack it and answer the questions that follow. You have to match the word with its code and then crack the code.

Words-

PIZZA, EMINEM, BREAD, KILLER, QUICK

CODED Version(not arranged corresponding to their words)-

PROOVI, YIVZW, JFRXP, KR33Z, V1RMV1

Question 4

What is the name of the folder that has the highest number of subfolders in it (Coded Name)?

- A) HSIR1K
- B) JFZIP
- C) ZORZ
- D) YLHLM

Question 5

According to the number of subfolders in a folder, how many folders we have if the criteria for being a folder is to have 4 or more subfolders in it?

- A) 2
- B) 4
- C) 6
- D) 7

SLIDING



Aparna, mother of Arunjyothi gives her a big box of chocolates. However, before handing over the box to Arunjyothi, Aparna asks her to solve the Sliding Coins puzzle.

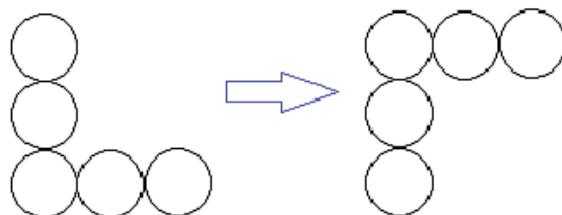
Sliding coins is a puzzle in which an arrangement of coins is rearranged to another arrangement by sliding one coin at a time. The following are the rules according to which the rearrangement has to be done.

- All coins are of the same size and shape, i.e., circular
- All coins lie in a plane and cannot be kept one over the other.
- A move involves sliding a coin to a new position that touches at least two other coins without disturbing any other coin during its motion.

Here is the puzzle which Arunjyothi has to solve. Can you help her to rearrange the arrangement at the left to that at the right given in the questions that follow?

Question 6

How many minimum number of moves are required to complete the task?



(A) 6

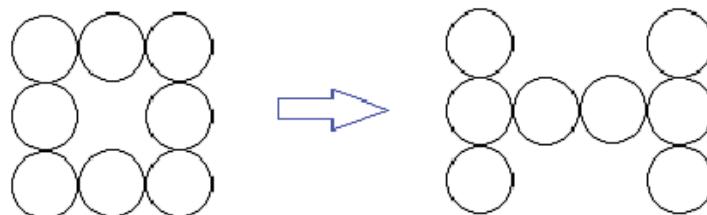
(B) 7

(C) 9

(D) None of these

Question 7

How many minimum number of moves are required to complete the task?



(A) 6

(B) 5

(C) 8

(D) None of these



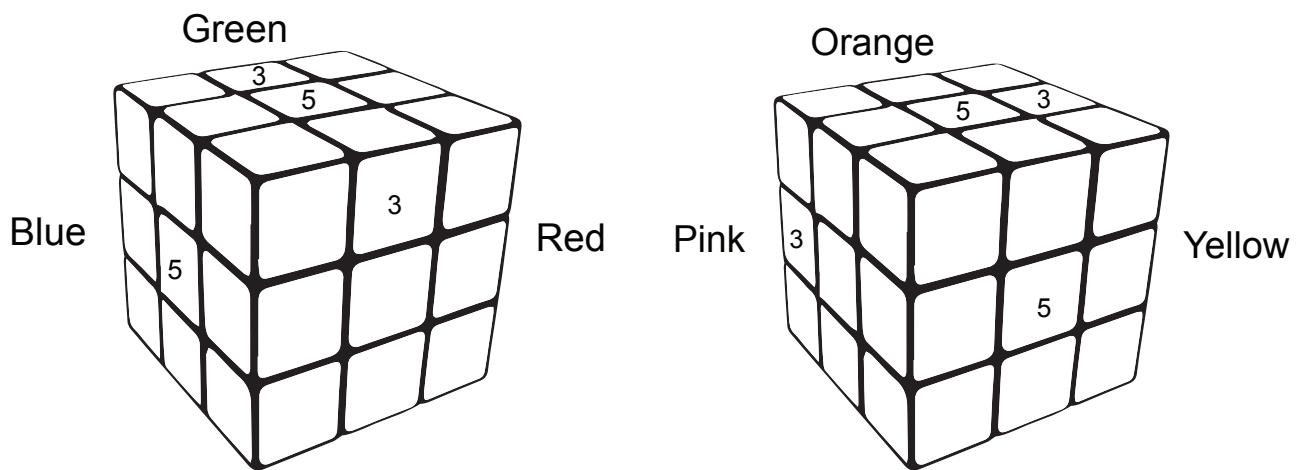
Question 8

Consider a Rubik's (3x3x3) cube with its faces having the colors green, blue, orange, yellow, red and pink such that

- Blue is adjacent to green but not to yellow
- Green is adjacent to red but not to orange

It is known that some of the small cubes of the Rubik's cube are defective. Here are some clues to identify them.

A number is mentioned on some of the cubes. This number implies the number of defective cubes among the cubes touching the cube on which the number is written. (For example: number of cubes touching center cube of the entire Rubik's cube is 26)
So here are the faces of Rubik's cube with numbers on some of the cubes.



Find out the number of defective pieces?

- (A) 8 (B) 12 (C) 16 (D) 9

Question 9

Let Technometrics be an arithmetic in which there are just 5 digits.

- 0 may represent 0 or 5
- 1 may represent 1 or 6
- 2 may represent 2 or 7
- 3 may represent 3 or 8 and
- 4 may represent 4 or 9.

For example- If 1430 is a number in Technometrics, it can denote 16 different numbers of normal number system out of which some are 6480, 1935, 6980.... or 1485. But a number in normal number system can have only 1 Technometrical representation.

In a book of Technometrics, Sweta finds a question which said,

"Given $(1041)^2 = 2324131$ and $(2221)^2 = 2201121$, find the Technometrical representation of B-A where A is the normal representation of 1041 and B is the normal representation of 2221."

Help Sweta find the answer.

(How to answer? Answer the four digits of B-A)

"Eg:- if the answer is 80 then mark your answer as 0080"

Question 10

There are 5 persons who are trapped in 5 different elevators. There are 49 floors in the building. The 5 persons are respectively on the 17th, 26th, 20th, 19th, 31st floors. The elevator doors open only when all the elevators are between 21st and 25th floor in descending order. There are 2 buttons +8 and -13 that will be activated only when 2 elevators are selected together. The person on the 19th floor decides to take charge and get all of them out.

What is the minimum number of moves in which he can accomplish the target?

- A) 10 (B) 12 (C) 14 (D) 16

Question 11

There are 16 secret agents who each know a different piece of secret information. They can telephone each other and exchange all the information they know. After the telephone call, they both know everything that either of them knew before the call.

What is the minimum number of telephone calls required so that all of them know everything?

- A) 28 (B) 53 (C) 120 (D) None of these

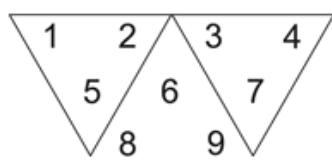
De_Cipher Πυραμιδ Pyramid

Question 12

Aditya while browsing the internet, searching for different types of cipher methods landed upon the De_cipher Pyramid methodology where to encode characters, they are written in the form of a downward pyramid in such a way that the first level contains even number of characters and each level contains 1 character less than previous level. The Pyramid need not be complete up to the tip but its each level should be complete. Then, two diagonal lines are drawn from the midpoint of first level of pyramid splitting it into three parts (not necessarily containing same number of characters) and the numbers are interchanged as shown.

Pyramid for Numbers (1 to 9)
 $6452 = 6173$

Correct Pyramid



Even number of characters in 1st level

$$2 \leftrightarrow 3$$

$$1 \leftrightarrow 4$$

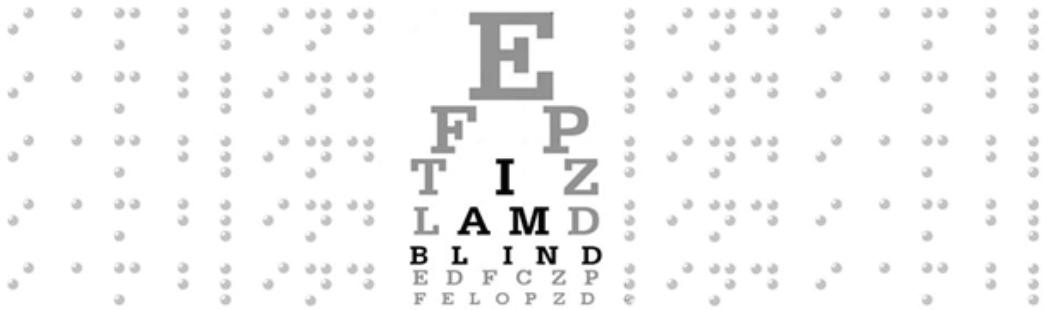
$$5 \leftrightarrow 7$$

6,8,9 remains same

Similarly, a pyramid satisfying the given conditions can be drawn for Alphabets, which can then be used to encode characters. Now, Aditya has to decode this message using the same.

HEEOFQDE QI LIBOF

How many consonants are there in the message that Aditya has decoded?



Betting is available

Seven Blindfolded prisoners are pushed onto a hanging platform, which is open at both the ends. Below, there is a large pool of volcanic lava which is hot enough to instantly kill upon contact. The metal surface of the platform is steaming hot, so the prisoners must constantly walk at a minimum speed of 0.5m/s, to ensure that their legs are not burnt. Two prisoners walking in opposite directions, upon collision will reverse direction but continue to walk at the same speed. It is obvious that eventually all of them will fall off the platform. The platform is 11m long, and the initial positions of the prisoners are as shown in the figure, but their initial directions (i.e. left or right) may be different. Following are some of the prisoners' thoughts during the last moments of their life:

Question 13

Clearly, the total time taken for all the prisoners to fall off the platform depends on the initial orientation of each of the prisoners. Prisoner A notices that if they orient themselves in a particular manner, the total time can be maximized.

What is the maximum possible total time?

Question 14

Prisoner B (the one with the bald head) is of the greedy kind, and thinks only for himself. The time taken for prisoner B to fall off the platform depends not only on his initial orientation but also on the initial orientation of the rest of the prisoners.

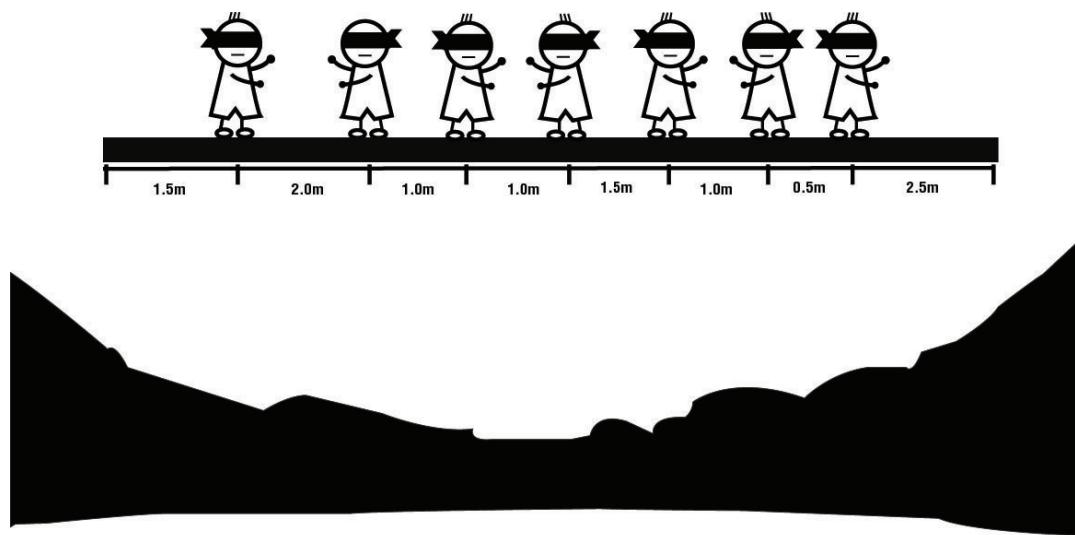
What is the maximum time for which Prisoner B can stay alive?

Question 15

Prisoner C on the other hand is an accomplished mathematician. He is not worried by any of these “worldly” issues. Rather, he would like to spend the last few minutes of his life solving an interesting math problem. His favourite number is 13, and he would like to find out how many distinct initial orientations of prisoners would lead to a total of 13 collisions before all of them fall off.

What is the answer to this problem?

- (A) 0 (B) 2 (C) 3 (D) 1



Illuminated

Tapan had recently read the novel ‘Angels and Demons’ and he was vastly impressed by the ancient brotherhood of Illuminati, a secret cult who believe “Science is the new God.” Being an enthusiast of Science, he researched about the organization in a hope to join it and was able to track their roots in modern-day Germany. He mailed to the Master Sabazius and Sabazius replied with a set of tasks for Tapan’s initiation into the brotherhood.

TASK 1

The Illuminati consider the numbers 11, 13 and 33 as sacred. Sabazius has presented Tapan with 11 cards (numbered 1 to 11) each having a unique positive integer, and the sum of numbers on all the cards equals 3313. The first 10 cards have numbers forming an increasing sequence, and the 11th card has a number which is greater than the number on the 10th card by n .

To guess the sequence, Sabazius wrote: The world is about duality. To become an Illuminatus, you must be twice the man you are now.

To find n , Tapan is posed with the following statement: n is the largest 3-digit number that is a fifth power.

Tapan must choose 3 cards among the 11, in such a way that the numbers on the cards chosen add up to 1333. There is only one way this can be done.

Question 16

What is the sum of the card numbers required to get the sum as 1333? (E.g. if cards 2,4,5 are required, answer should be 11.)

- (A) 24 (B) 18 (C) 16 (D) 10

TASK 2

The Illuminati cult has a total of n (same as the earlier n) members presently. The members are divided into 3 classes: Novice, Minerval, and the Illuminated. Each class consists of a different number of members.

Novice consists of groups of 11 each.

Minerval consists of groups of 13 each.

Illuminated consists of groups of 33 each.

Tapan is further told that Novice has the maximum number of groups and Illuminated has the minimum. Moreover, each class has a composite number of members.

Question 17

Which class must Tapan join such that even after his initiation, the number of members in all the classes remains composite?

TASK 3

Supervising all the 'n' members is a group of 4 Masters called the Elite. The 4 are Sabazius, Baldur, Gerold and Dagmar. Sabazius is willing to initiate Tapan directly into the Elite group, provided he can solve the third riddle.

For a ritual of the Elites, the 4 Masters have come together and are staying at the Leonardo Royale hotel. Tapan has been invited to the hotel as the fifth Master.

The hotel consists of 5 rooms and a small restaurant that contains 5 tables. Each Master has a rank, which shows his level of thinking with respect to the whole group. The master with the first rank is said to be the Grand Master, and it is not Tapan. Rooms, as well as tables, are successively numbered from 1 to 5 in a way that each Master lives in a room and sits at a table different in number from his rank. To avoid confrontation, Masters with successive ranks are allowed neither to live in rooms next to each other nor to eat at tables next to each other. To become an Elite, Tapan just has to figure out his rank, room no. and table number. It is known that:

- Sabazius does not eat at the fifth table.
 - Baldur is not the Grand Master.
 - Sabazius has exactly the middle rank between Dagmar and Tapan.
 - Baldur is more intelligent than Sabazius.
 - Gerold eats at a table next to Baldur.
 - Dagmar does not eat on a table with the same number as his room number.

Question 18

What is Tapan's table number among the Masters?

Coded Pillar

Betting is available

In an attempt to find more information about the first British voyage to India, two archaeologists Zilani and Snehit went on a excavation journey. On reaching a rather denser part of the forest, both of them fell down in a very deep moss covered cave, following through the cave they reached a door in front of which was kept a pillar with some inscribes. Going through it vigorously and carefully they were able to deduce that it was a kind of coded puzzle pillar. After more investigation around the pillar, delicate sampling and detailed analysis they came down to this, that the pillar dated further back in time than the first reported voyage of the British in India. The complete understanding of the pillar might bring about quite a big change in Medieval Indian history. The decoding of this is also really important at this moment because this code and the door behind it is their only way out the cave, and they are running out of supplies. Help them solve the mysteriously coded pillar.

Pillar is

FACE 1		FACE 2		FACE 3		FACE 4	
N	H	U	R	W	A	A	R
F	N	A	E	A	R	M	T
I	E	M	S	I	S	I	Y
Y	E	H	D	D	O	N	A

Properties

- This is a pillar which is square in shape from top view.
- It has a property that each row can rotate about the vertical axis.
- Each column (adjacent columns) connected with the edges are always together and can be interchanged with the other edge columns.

Example

FACE 1				FACE 2			
A		B		I		J	
C		D		K		L	
E		F		M		N	
G	1	2	H	O	3	4	P

Here 2 & 3 are always together. And 1 & 4 are always together and can be interchangeable with 2 and 3.

Question 19

The code represents a sentence. Find the number of words in above sentence.
(Note: Sentence or word will form like this:-

H	E	D	U
L	P	D	E

Here word is “ HELP DUDE ”.)

- (A) 12 (B) 6 (C) 9 (D) None of these

Question 20

What are the minimum number of moves required to get the final sentence?

- (A) 8 (B) 6 (C) 10 (D) 4

Question 21

When you divide the preceding number alphabet with succeeding number alphabet (get the remainder) and then sum it. What corresponding alphabet you get for that number if A-Z has been numbered from 1-26 respectively.

- (A) K (B) E (C) F (D) N

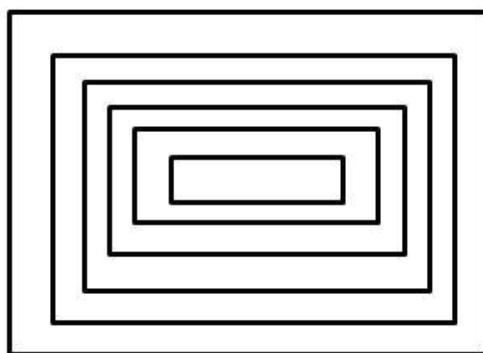
TIME TRAVEL

Betting is available

Shashank developed a machine for time travel. The machine he developed works in this fashion:

If suppose one switches the machine on for an hour, then after switching it off; for the next 1 hour, everything within the machine travels backwards in time for the same duration. Then, to satisfy his curiosity, he performs a very unusual experiment on the machine. He creates 6 such time machines and places each of them in a box in a box pattern as shown in the given figure.

Now what he does is that he switches on the innermost machine at 8 a.m. on Wednesday and goes away. Then he returns at 6 p.m. in the evening, switches off the machine and sits inside it. Now after the next 10 hours of time travel, he gets out of the machine at 8 a.m. again. At 9 a.m. he comes back and switches on the machine next to the innermost one. Then he goes away and returns at 7 p.m. in the evening, he switches off the machine and sits inside it but outside the innermost machine. He follows the same pattern and thus starts time travelling in all the machines. We define one cycle as the time duration till he finishes the time travel in all the machines at least once.



Question 22

How far back in time (in hours) does Shashank when present in the innermost box go at the end of one such cycle?

- A) 60
- B) 49
- C) 105
- D) 80

Question 23

At 9:00 am on Wednesday, how many versions of Shashank are present simultaneously (after one cycle)?

- A) 6
- B) 12
- C) 3
- D) 11

Question 24

The next day Shashank decides to do something even more drastic. He wanted to see what would happen if he goes back in time and stops himself from using the time machine ever. To do this he has to go to 6 am on Wednesday. The present time on Thursday is 12 noon. It takes him 10 hours to make a time machine. So if he decides to time travel in the same way as he had already done then at minimum how many time machines will he need in a box-in-a-box pattern?

- A) 4
- B) 5
- C) 3
- D) 7

Question 25

If he wants to use the bare minimum number of time machines then for at least how long he should stay in the machines?

- A) 25 hours
- B) 25.5 hours
- C) 30 hours
- D) 30.5 hours

A word from the Organizers of Technothlon 2014

Congratulations!

You just attempted a paper which has been argued as one of the most competitive examinations conducted for the school students in India and abroad. As you sat behind your desks, scratching your pens and brains, spending your last two and half hours attempting the paper in front of you, along with lakhs of your peers all over the globe, hundreds of thoughts might have crossed your minds. We too while making this paper had our own set of apprehensions and doubts. Often during the course of preparation of the paper, we did ask ourselves a few questions: "Is the paper too tough? Will the students find it interesting to solve the paper? Are the questions too arbitrary?"

However, finally when the question paper reached into its final stage as is before you, all our anxieties got wiped off. The paper has been so designed that you along with your partner can solve all the questions within the stipulated time. Also, you do not need to be the alter ego of Albert Einstein to solve the paper. Our motto is to inspire all the young minds who write the paper and with that sole intention do we frame the questions so that we can select the best and the brightest buddies of our nation. Having a decade long experience of inspiring young minds worldwide, this eleventh edition of Technothlon prelims comes close to testing the mental prowess that a student requires to become a world leader and in turn inspire as many young minds as he/she can.

Making it through the preliminary round definitely adds another feather to your hat. However, don't lose hope if you somehow don't manage to make it to the top notch because one sheet of paper cannot decide your future. As has been aptly quoted by Conrad Hilton, "Success seems to be connected with action. Successful people keep moving. They make mistakes, but they don't quit". We do hope that you will positively take up this challenge, again come back next year and clear one of the most competitive exam.

This paper which lies in front of you is the fruit of the countless number of hours of effort put in by our team members. You might have observed quite a few names making their appearance in the questions. Those are the names of Technothlon team members who have worked so diligently day and night and put in their heart and soul to make the question paper right from scratch to its present form. As you might see, they have done a commendable task! We do hope that you will enjoy solving the paper as much as we did while preparing it!

Good luck for your future ahead!

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 is our means of reaching out to the student community. Be connected, stay updated!

We are eager to help you through counselling 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

Bhavin Mandalaywala
Sayantan Dutta

Himanshu Goyal
Mohammed Zilani
Rajesh Uppala

Ashima Jain
Rahul Kadyan

Contact us at

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<https://www.facebook.com/technothlon.techniche>



Started fifteen years ago in 1999, Techniche was conceptualized with an aim to motivate the youth of our nation to think out of the box, expand their horizons and reach the zenith of success in all techno management spheres. It has stayed true to its vision since, and from its humble beginnings, Techniche now reveals in being one of the premier techno management festivals of the nation.

• **Lecture series :**

A signature dish that is served at Techniche is the Lecture Series, which serves as a platform that allows illustrious figures from all walks of life to come under one roof and share their experiences and ideas with the next generation. Students and professors, participants and school children alike, all clamour into the auditorium to have their lives inspired by the likes of **John C. Mather (The 2006 Physics Nobel Laureate)**, **Pat Spain (Host of the show, Beast Hunter on National Geographic)**, **Jonathan Grudin (Principal Researcher, Microsoft Research)**.

• **Industrial conclave :**

The Industrial Conclave provides a quintessential platform for young entrepreneurs and budding corporates to broaden their horizons and understand the internal dynamics of the ever growing industry. After successfully organizing three editions in the past, which saw the likes of Mrs. Anu Aga (ex-Chairperson, Thermax), Prabhu Chawla (Editorial Director, The New Indian Express).

• **Spell Bee :** In association with India Spell bee

We welcome you to 'spell' the beans here at Techniche, IIT Guwahati, as we conduct our very own first Spelling Bee this year.

Prizes worth Rs. 75,000/-

• **Robotics Module :**

The Robotics module of Techniche 2014 provides you a platform to bring forth new ideas and produce novel technologies in the quest to build the perfect machine. So, put your thinking caps on and let the creative juices flow. With new events in the pipeline, the competition is set to be the ultimate test in skill and design. So, cover all the bases and get the dynamics right to make your bot the best of the lot.

• **Exhibitions :**

Techniche witnesses unique exhibitions like Robosoft Systems, ASET Robotics, Light Logics TouchMagix, Amar Chitra Katha, Indian Army, Indian Railways, NDRF and DRDO. These are great learning experience as well as brilliant showcases from various fields of innovation. Join us this Techniche as we exhibit brilliance.



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SCRAP SHEET



SCRAP SHEET

