ROBOTIX

TECHNOLOGY ROBOTIX SOCIETY

in assocation with

IEEE Student Branch
IIT Kharagpur

Winter Workshop Test

Date:1/11/2016 **Maximum Marks:25+30+15=70** **Time: 60 minutes**

General Instructions

1. This exam consists of three sections:
   - Logical Resoning
   - KRAIG
   - Programming
2. The third section is optional. It is to be attempted by those who would like to take part in the Image Processing workshop
3. Make sure all the information below is filled up

Name: _____

Roll No.: _____ **Hall:**_____ **Contact:**_____

Which Workshop are you planning to do? Autonomous ☐ Image Processing ☐

Prior Knowledge in Programming? Yes ☐ No ☐

What is your EAA? NSO ☐ NCC ☐ NSS ☐

Which Phase will you attend? $1^{st} Dec - 7^{th} Dec$ ☐ $10^{st} Dec - 16^{th} Dec$ ☐

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Section	1	2	3	Total
Marks				

Corrected By: _____

LOGICAL REASONING

1. (2 points) Before Mt. Everest was discovered, what was the tallest mountain in the world?.

   _____

2. (2 points) Which word in the dictionary is spelled incorrectly?

   _____

3. (2 points) Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?

4. (4 points) Adam, Bob, Clair and Dave are out walking: They come to rickety old wooden bridge. The bridge is weak and only able to carry the weight of two of them at a time. Because they are in a rush and the light is fading they must cross in the minimum time possible and must carry a torch (flashlight) on each crossing.
They only have one torch and it can't be thrown. Because of their different fitness levels and some minor injuries they can all cross at different speeds. Adam can cross in 1 minute, Bob in 2 minutes, Clair in 5 minutes and Dave in 10 minutes.
Adam, the brains of the group thinks for a moment and declares that the crossing can be completed in 17 minutes. There is no trick. How is this done?

5. (3 points) Fernando Alonso and Sebastian Vettel go for a car race. Before start of race, both of them have the exactly same amount of fuel in their respective cars. With the given fuel Fernando can drive continuously for 4 hours while Vettel can drive 1 hour more i.e five hours.After a time they realize that amount of fuel left in Sebastian car is 4 times the fuel in Fernando car.For how long they are racing ?

6. (5 points) A man desired to get into his work building, however he had forgotten his code. However, he did recollect five pieces of information

    1. Sum of 5th number and 3rd number is 14.
    2. Difference of 4th and 2nd number is 1.
    3. The 1st number is one less than twice the 2nd number.
    4. The 2nd number and the 3rd number equals 10.
    5. The sum of all digits is 30.

    Crack the code ?

7. (4 points) Two women play a dice game where two standard dice are rolled. Woman A says that a 11 will be rolled first. Woman B says that two consecutive 8s will be rolled first. The women keep rolling until one of them wins.

    What is the probability that A will win ?

8. (5 points) Eight family members A, B, C, D, E, F, G and H are sitting around a circular table but not necessarily in the same order. Some of them are females and some of them are males. All of them are related to each other in the same way or the other. Some of them are facing the centre while some are facing outside.

    - Only two people sit between B and E, B faces the centre. F sits second to the right of B. E is the wife of A. No female is an intermediate neighbour of E.
    - C is not an immediate neighbour of B. C is the daughter of E. Both the immediate neighbours of C face the centre. Only three people sit between A and Cs brother. F is not the brother of C. Neither A nor Cs brother is an immediate neighbour of F.

- H, wife of B sits to the immediate left of D. Both G and A face a direction opposite to that of C. Cs husband sits second to the left of G. Bs father sits to the immediate right of E.B sits second to the right of F.

1. Who among the following faces outside the centre ?

   A. C and F
   B. F and G
   C. G and H
   D. A and G

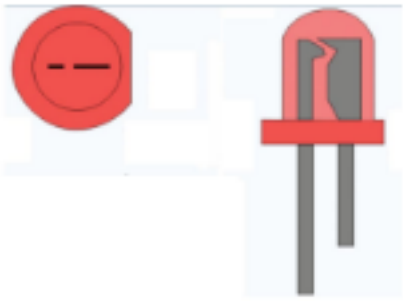
2. Who among the following is brother of C ?

   A. A
   B. D
   C. B
   D. H

Space for Rough Work

KRAIG

1. (2 points) Write the full-forms of:
    1. PWM: _____
    2. OpAmp: _____
    3. IC: _____
    4. RPM: _____
2. (3 points) Write True or False:
    1. An Ackerman Drive bot can move in any direction by changing its orientation:
    2. Zener diodes conduct in Forward Bias:
    3. Scissor lift mechanism is used for cutting:
    4. OpAmps can be used as Comparators:
    5. IR photodiodes dont become conducting when exposed to sunlight:
    6. If a DC motor is connected to an AC source, it will periodically change direction of rotation:
3. (10 points) Select the correct option. (More than one may be correct):
    i. Which is the anode of an LED:



        A. The longer terminal
        B. The shorter terminal
        C. The terminal on the side which has a cut in the bulb
        D. The terminal which is on the side of the bulb without a cut

    ii. Relays are useful because:
        A. They can keep the user safe from shock.
        B. They are quickest available electronically operated switches.
        C. They are cheap.
        D. All of the above.

    iii. Regarding motor driver L293D which of the following are correct?
        A. If Enable pins are LOW the motors are in free run.
        B. If Enable pins are LOW the motors are in breaking condition.
        C. If En1 pin is HIGH, and In1 and In2 pins are LOW, motor is in breaking condition.
        D. If En1 pin is HIGH, and In1 and In2 pins are HIGH, motor is in breaking condition.

iv. Diodes are :

A. Bi-directional switches.
B. Conductors when N-side is connected to anode and P-side to cathode.
C. Used in voltage regulation circuits.
D. All of the above.

v. What are pins 4 and 5, and 12 and 13 of the L293D used for?

A. Ground
B. Heat sink
C. Input
D. Output

4. (5 points) Select the correct option (Single-correct type question):

i. If a pulsating signal is high for 0.3 ms and off for 0.1 ms in a cycle, what is the frequency and duty cycle of it?

A. 33.33 ; 66.67%
B. 25 ; 75%
C. 33.33 ; 75%
D. 25 ; 66.67%

ii. What voltage will an ac voltmeter display?

A. RMS
B. Peak Value
C. Average
D. Peak-to-peak value

iii. OpAmp is a:

A. Voltage controlled Voltage source
B. Voltage controlled Current source
C. Current controlled Voltage source
D. Current controlled Current source

iv. What are the effects of moving a closed wire loop through a magnetic field?

A. Enable
B. Vcc
C. Supply Voltage
D. GND

v. In a factory where there are flammable fluids stored, which types of switches are most likely to be used in the storage rooms?

A. Transistors
B. Relays
C. SPSTs
D. All of the above

5. (5 points) Design a control circuit for a differential drive with 2 motors, using BJTs or MOSFETs.

Programming

1. (1 point) Where is the memory allocated from when you do:
int *p = malloc(5 * sizeof(int));

   A. Stack

   B. Heap

   C. Some special memory reserved by compiler

   D. The Operating System decides at the run time

2. (1 point) Which of the data types can overflow? Multiple can be correct

   A. int

   B. float

   C. unsigned int

   D. double

3. (1 point) Lets say you want to calculate distance between the points (x1, y1) and (x2, y2). Which is a more appropriate expression?

   A. sqrt(pow((x2 - x1), 2) + pow(y2 - y1, 2)))

   B. (y2 - y1) * sqrt(pow((x2 - x1)/(y2 - y1), 2)+1)

4. (2 points) Is this code valid?

```
#include <stdio.h>
int main() {
        int a = 2, b = 3;
const int *p = &a;
p = &b;
return 0;
}
```

   ☐

5. (1 point) Where is the memory allocated from when you do:
int *p = malloc(5 * sizeof(int));

   A. Stack

   B. Heap

   C. Some special memory reserved by compiler

   D. The Operating System decides at the run time

6. (2 points) Which is a valid representation of a string? Multiple can be correct.

   A. char str[5] = {'a', 'b', 'c', 'd', 'e' };

   B. char str[5] = {'a', 'b', 'c', 'd', 'e', '\0'};

   C. char str[5] = {'\0', 'a'};

   D. char str[5] = {'a', 'b', 'c', 'd', '\0'};

   E. char str[5] = {'a', 'b', 'd', '\0'};

7. (1 point) How would you swap the value of two integers a and b without using a temporary variable?

8. (2 points) What is the difference between ‘char *a‘ and ‘char a[ ]?

9. (2 points) Write only for loops for printing this sequence:
1
12
123
1234
12345
1234
123
12
1

10. (2 points) What does this function declaration mean?

```
(int *) (*f)(int x, int *y)
```

A. A function named f return a pointer to an integer and it takes an integer argument and a pointer to an integer as argument.

B. A pointer to a function named f which returns a pointer to an integer and it takes an integer argument and a pointer to an integer as argument.

C. A function f which returns an integer and takes an integer argument and a pointer to an integer as argument.

D. A function f which returns a pointer to an integer and takes an two integers as arguments.