$2^n = 256$

$2^8 = (4)^4 = 16$ = 8 bits = 64 bytes

INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM 695 547

First Year B. Tech. - Quiz I
MA122-Computer Programming and Applications

12.02.2019 Time: 09:00-10.00 Maximum Marks: 30

Note: *There are five pages in this question paper. Answer* **all** *questions. Do not* **split** *your answers.*

SECTION A

There are ten questions in this section. Each questions carry 2 *marks.*

1. Which of the following is not one of the sizes of the floating point types?
   (a) short float
   (b) float
   (c) long double
   (d) double

2. Which is correct with respect to size of the data types?
   (a) char > int < float
   (b) int < char > float
   (c) char < int < float
   (d) char < int < double

char → 1 byte
float → 4 bytes
int = 4 bytes / some say 2 bytes
double = 8 bytes

3. What is the correct definition of an array?
   (a) An array is a series of elements of the same type in adjacent memory locations
   (b) An array is a series of element
   (c) An array is a series of elements of the same type placed in adjacent memory locations
   (d) None of the mentioned above

7 % 3

5 + (6 * 7) - (7 % 3)

5 + 42 - 1

46

4. What is the output of the following program?

```
#include <iostream>
using namespace std;
int main()
{
    float i = 123.0f;
    cout << i << endl;
    return 0;

}
```

123.00

123

5. What is the output of the following program?

```
#include<iostream>
using namespace std;

void display(const int const1)
{
  const int const2=5;
  int array1[const1];
  int array2[const2];
  for(int i=0;i<5;i++)
  {
    array1[i]=i;
    array2[i]=i*10;
    cout<<array1[i]<<" "<<array2[i]<<" ";
    }
}

int main()
{
  display(5);
}
```

const1 = 5
const2 = 5;

array1[5];
array2[5];

array1[0]
array1[1]
↓
array1[4]

i = 1

i = 0

arr1[0] = 0
arr2[0] = 0 × 10 = 0

return 0;

6. What is the output of the following program?

```
#include<iostream>
using namespace std;
int main()
{
  int i = 5, j = 6, k = 7, n = 3;
  cout << i + j * k - k % n << endl;
  cout << i / n << endl;
  return 0;
  }
```

5 + (6 * 7) - (7 % 3)

43

1

	arr1	arr2
[0]	0	0
[1]	1	10
[2]	2	20
[3]	3	30
[4]	4	40

5 / 3 = 1

2 *, /, % → PL 5 (L→R)

+, - → PL 6 (L→R)

7. What is the output of the following program?

```
#include<iostream>
using namespace std;
int main()
{
  int sum,x;
  x=1;sum=0;
  while(x<=10)
  {
    sum+=++x;
  }
  cout<<"The sum is:"<<sum<<endl;
  return 0;
}
```

8. What is the output of the following program?

```
#include<iostream>
int main()
{
  int vector[5]={1,-3,2,3,-1};
  int len=5;
    int best = 0, current = 0;
    int i = 0;
    for(i = 0; i < len; ++i)
    {
        current += vector[i];
        if(current < 0)
        {
            current = 0;
        }
        best = best > current ? best : current;
    }
  std::cout<<best<<std::endl;
    return 0;

}
```

current	best	after
1	1	i=0
0	1	i=1
2	2	i=2
5	5	i=3
4	5	i=4

9. What is the output of the following program?

```
#include<iostream>
using namespace std;

int main()
{
  for(int i=0;i<8;i++)
   if(i%2==0) cout<<i+1<<"\t";
   else if(i%3==0) cout<<i*i<<"\t";
   else if(i%5==0) cout<<2*i-1<<"\t";
   else cout<<i<<"\t";

   return 0;
}
```

10. What is the error in the following program?

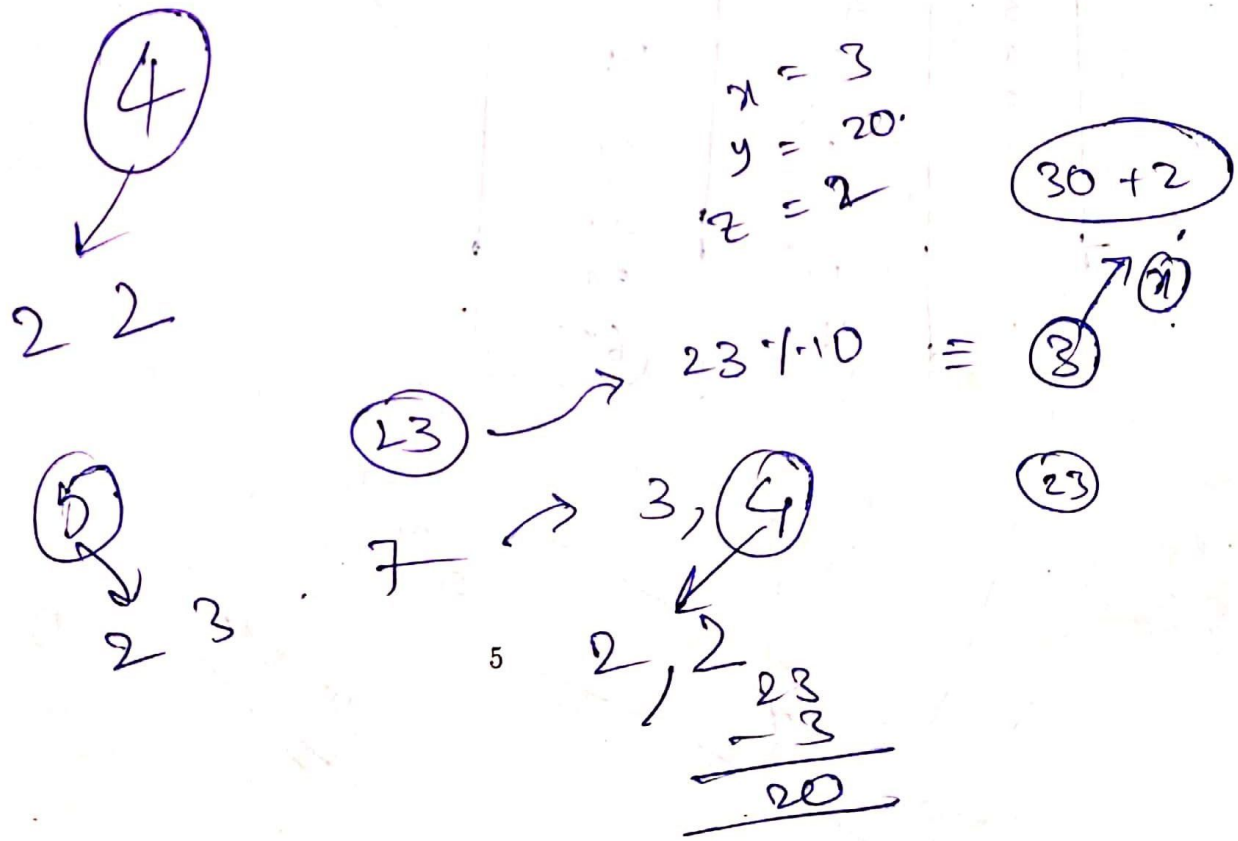
```
#include<iostream>
using namespace std;
int main()
{
    float a,b,c,d;
    a = 1.00;
    b = 2.20;
    c = 1.21;
    d = b*b - 4*a*c;
    cout<<d<<endl;
    if (d > 0)
        cout << "Positive and distinct roots" << endl;
    else (d < 0)
        cout << "Imaginary roots" << endl;
    if (d == 0)
        cout << "Positive repeated roots" << endl;
    cout << "end of code" << endl;
    return 0;
}
```

SECTION B

There are two questions in this section. Each questions carries 5 *marks.*

11. Write a function `list` to find the largest list of prime numbers for a given number N that will give N after summation of the list. Write a `main()` to implement the function `list`.
Sample Input:
7
Output:
2 2 3

12. Write a program to find and display the reverse of a given integer number.



INDIAN INSTITUTE OF SPACE SCIENCE & TECHNOLOGY

B. Tech(I Year) | Physics - II (PH121) | Quiz 1

11 Feb' 2019 | Duration:1 Hrs | Full Marks: 30

Answer all questions(All questions carry equal marks)

1. $\mathbf{B} = b\hat{\mathbf{z}}$ is a constant vector, find a vector potential $\mathbf{A}$ such that $\nabla \times \mathbf{A} = \mathbf{B}$. Is it unique?

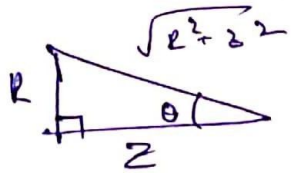
2. Find the curl of the vector function $\mathbf{B}(s, \theta, z) = \frac{1}{s}\hat{\theta}$ (expressed in cylindrical coordinates). Note: The curl must be consistent with the Stokes' theorem (say, around a circular loop centered at the origin).

3. Find the flux of the curl of the field $\mathbf{v} = \frac{1}{r^2}\cos\theta\hat{\mathbf{r}} + ar\sin\theta\cos\phi\hat{\theta} + b\cos\theta\hat{\phi}$ through the hemisphere $r = 4$, $z \leq 0$. Show that it is consistent with Stoke's theorem.

4. A sphere of radius R_1 has a charge Q distributed uniformly over its surface. If a sphere of radius R_2, with the same charge (uniform density) were to have 90% of the energy stored in its electrostatic field as the former, find R_2 in terms of R_1.

5. A spherical shell has uniform surface charge density σ. A small circular disc is removed from the surface. Find the electric field at the center of the hole left behind on the surface of sphere.

6. An infinitely long cylinder of radius R is uniformly charged.
   a) Find the electric field at any point, both inside and outside the cylinder.
   b) Find the potential at any point s from the axis. What would you chose as your origin?



INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
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QUIZ-I

AV 121 – Basic Electronics Engineering

Time: 1 hour Date: 13/2/2019 Max. Marks: 25

Answer the following

1. Simplify the Boolean function using Karnaugh map [6]
$F(A, B, C, D, E) = \sum m(0, 1, 4, 5, 16, 17, 21, 25, 29)$
2. Design and implement the circuit diagram of Mod-6 synchronous counter using JK Flip flop. [6]
3. Design and implement 2's Complement of a 4 bit number using Full adder circuit [5]
4. Realize the full subtractor using logic gates [6]
5. Use AND gates, OR gates and inverter to implement the following logic expression [2]
$X = \overline{ABC} + B(EF + \overline{G})$

End of exam.

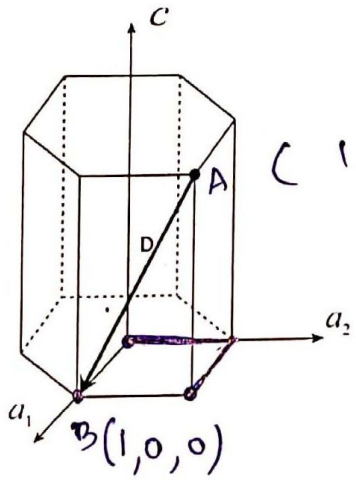
INDIAN INSTITUTE OF SPACE SCIENCE AND TECHNOLOGY
THIRUVANANTHAPURAM

Quiz I – February 14, 2019
CH 121- Materials Science and Metallurgy
B Tech - Second Semester

Time: 1 h **Max. Marks: 30**

Answer all questions

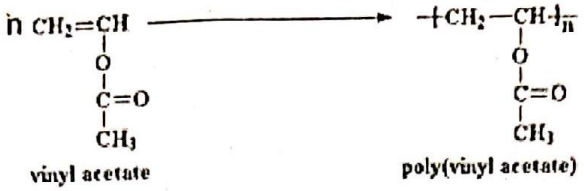
1. What is meant by smart materials? Name one example. (2 marks)
2. Would you expect iron (Fe) or silicon nitride (SiN) to have a higher modulus of elasticity? Why? (2 marks)
3. Determine the miller indices for the direction (D) in the hexagonal lattice shown in the following Figure using both three digit and four-digit systems. (3 marks)

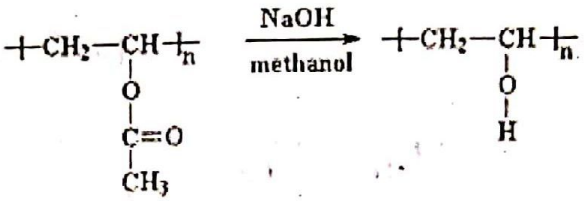


4. Calculate the planar density of the plane (110) of FCC Nickel unit cell. Atomic radius of Ni = 0.124 nm. (give the result of planar density in cm^{-2}) (3 marks)
5. Magnesium aluminate ($MgAl_2O_4$) has the normal spinel structure and the density is 3.579 g/cm^3. Calculate the unit cell parameter 'a_0'. (write your answer in nm. given: atomic mass of Mg = 24.3 g/mol, Al= 27 g/mol, O= 16 g/mol, Avogadro's number = 6.02×10^{23} /mol) (5 marks)
6. You are asked to polymerize acrylonitrile (CH_2=CHCN) for obtaining polymer with PDI ≈ 1. Suggest and explain the polymerization reaction and mechanism by which you would prepare the polymer and the reason for your choice. (4 marks)
7. Suggest and explain a polymerization technique by which you would be able to prepare polymer in the form of beads (0.1-2 mm). (3 marks)
8. Poly(vinyl alcohol is prepared by hydrolysis of poly(vinyl acetate). It is observed that treatment of poly(vinyl alcohol) with periodic acid results in decrease in the molecular

weight of the polymer. Explain the reason for this observation based on the polymer structure and mechanism of polymerization. (Hint: periodic acid cleaves 1,2 diols)

(3 marks)





9. A sample of polystyrene is composed of a series of fractions of different sized molecules as shown in the table. Calculate the number average and weight average molecular weight of the polymer sample. (5 marks)

Fraction	Weight fraction	Molecular weight (g mol^{-1})
A	0.10	12,000
B	0.25	20,000
C	0.35	30,000
D	0.25	40,000
E	0.05	50,000

$\bar{M}_w = 29$

$\bar{M}_n \simeq 25$ K

1 nm → 10^{-7} cm

? ← ( ) cm

Indian Institute of Space Science and Technology

Thiruvananthapuram

Second Semester Examination, 2019

B.Tech

MA121: Vector Calculus and Differential Equations

Quiz 1

Date : 15thFeb, 2019 **Time: 9.00 am to 10.00 am** **Max. Marks: 15**

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1. Find the general solution of the equation

$$\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = e^{-3x}/x, \quad x > 0.$$

[5 marks]

2. Consider the IVP: $\frac{dy}{dx} = 1 + y^2, \quad y(0) = 0.$

Using the *Picard's existence and uniqueness Theorem*,

(a) verify whether the IVP has a unique solution.

(b) if so, find the maximum value of h $(h > 0)$ such that the IVP has a unique solution on the interval $|x| \le h$. **[4 marks]**

3. (a) Find the general solution of the equation

$$\frac{d^2y}{dx^2} + x\frac{dy}{dx} + x^2y = 0$$

in the form $y = c_0y_1(x) + c_1y_2(x)$, where $y_1(x)$ and $y_2(x)$ are the series solutions about $x = 0$. **[4 marks]**

(Compute up to the first two terms to each of y_1 and y_2.)

(b) Write the form of two linearly independent series solutions of the equation

$$x^2\frac{d^2y}{dx^2} + (x^2 - 3x)\frac{dy}{dx} + 3y = 0$$

about $x = 0$ for $x > 0$. **[2 marks]**

(Determining the coefficients in the series solutions is not required.)