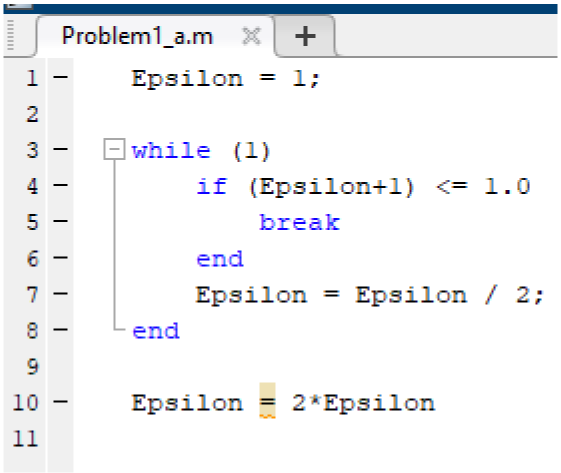
RAFAY AAMIR GULL
BSEE19047
NUMERICAL ANALYSIS A1

Q1 (A):

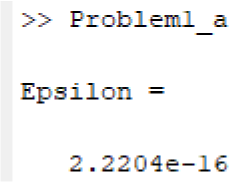
```
## Python Code
## Rafay Aamir
## BSEE19047

epsilon =1
while True:
    if epsilon+1 <= 1:
        break
    epsilon=epsilon/2
epsilon=epsilon*2

print("Epsilon of my Laptop is = ",epsilon)

#         Output
#   Epsilon of my Laptop is = 2.220446049250313e-16
```

MALTAB CODE



```
Epsilon = 1;

while (1)
    if (Epsilon+1) <= 1.0
        break
    end
    Epsilon = Epsilon / 2;
end

Epsilon = 2*Epsilon

```

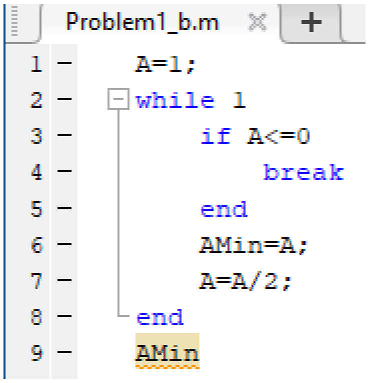
OUTPUT



```
>> Problem1_a

Epsilon =

   2.2204e-16
```

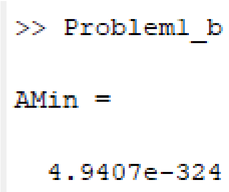
Q1 (B):

MATLAB CODE



```matlab
   A=1;
while 1
    if A<=0
        break
    end
    AMin=A;
    A=A/2;
end
AMin
```

OUTPUT



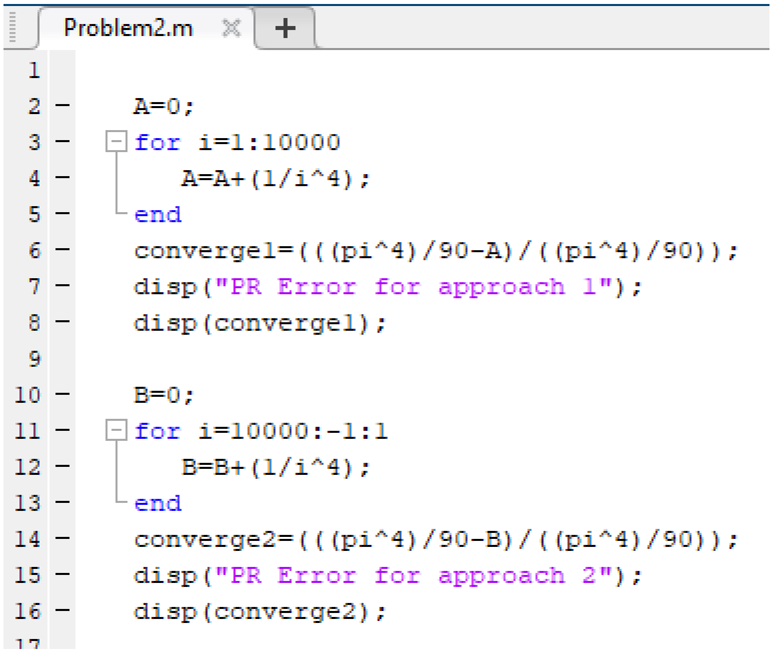
```
>> Problem1_b

AMin =

   4.9407e-324
```

Q2:

```
## Python Code
## Rafay Aamir
## BSEE19047

import math as m
n=10000
limit=((m.pi)**4)/90
approx_value=0
true_value=((m.pi)**4)/90
print("True Value = ",true_value)

for i in range(n):
    if i!=0:
        if approx_value>limit:
            print("Limit reached/ f converged to (pi^4)/90  at n = ",i," and approximated value of f = ",approx_value)
            break
        if approx_value<=limit:
            approx_value=approx_value + 1/(i*4)

approx_value=approx_value - 1/(i*4)
print("Approximated_Value", approx_value)
error=(true_value-approx_value)

print("The true reletive error is ",error)
```

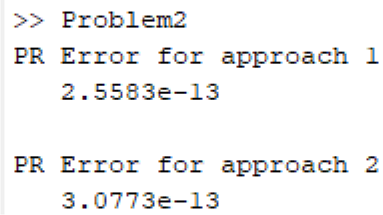
```
##       Output

##  True Value =  1.082323233711138
##  Limit reached/ f converged to (pi^4)/90  at n =  44  and approximated value of f =  1.0874996551504568
##  Approximated_Value 1.0818178369686386
##  The true reletive error is  0.0005053967424992756
```

MATLAB CODE



```

A=0;
for i=1:10000
    A=A+(1/i^4);
end
converge1=(((pi^4)/90-A)/((pi^4)/90));
disp("PR Error for approach 1");
disp(converge1);

B=0;
for i=10000:-1:1
    B=B+(1/i^4);
end
converge2=(((pi^4)/90-B)/((pi^4)/90));
disp("PR Error for approach 2");
disp(converge2);
```

OUTPUT

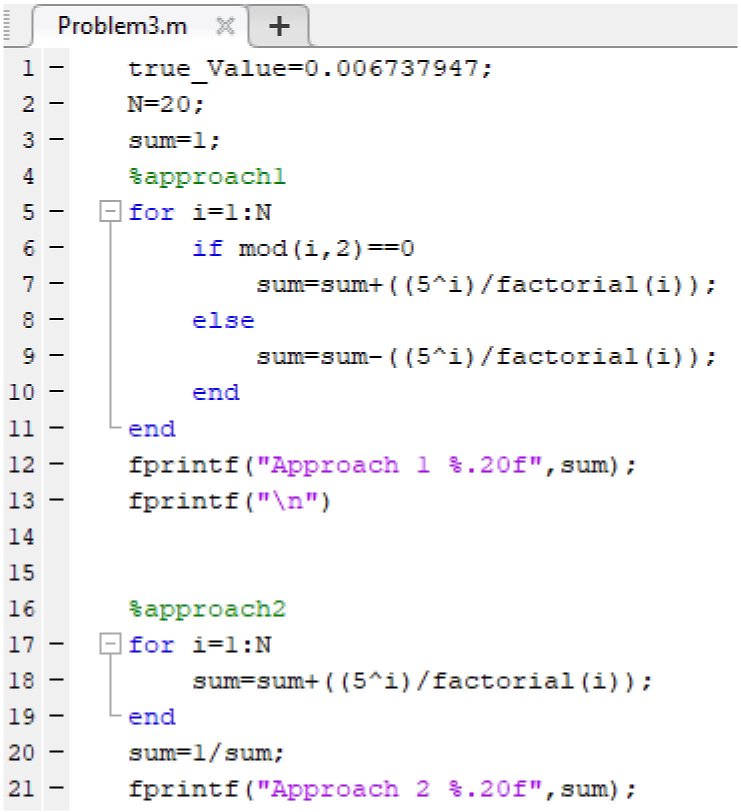


```
>> Problem2
PR Error for approach 1
   2.5583e-13

PR Error for approach 2
   3.0773e-13
```

Q3:

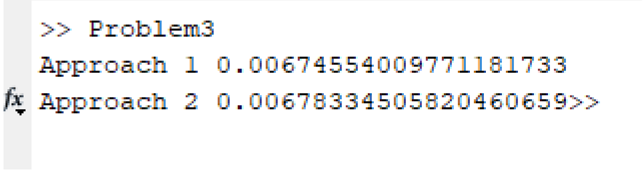
```
## Python Code
## Rafay Aamir
## BSEE19047


import math as mt

def factorial(number):
    fact=1
    for i in range(number+1):
        if i!=0:
            fact=fact*i

    return fact

def approach1(Tn, n):
    i=1
    sum=1
    for i in range(Tn):
        if i !=0:
            if (i%2==0):
                sum=sum+((n**i)/factorial(i))
            else:
                sum=sum-((n**i)/factorial(i))

    return (sum)


def approach2(Tn,n):
    i=1
    sum=0
    for i in range(Tn):
        if i !=0:
            sum=sum+((n**i)/factorial(i))
    return (1/sum)


true_value=0.006737947
Tn=20
n=5
print("True Value = ",true_value)
print("Approximated Value from Approach 1 = ",approach1(Tn,n))
print("Approximated Value from Approach 2 = ",approach2(Tn,n))


##        Output

##  True Value =  0.006737947
##  Approximated Value from Approach 1 =  0.006745540097711817
##  Approximated Value from Approach 2 =  0.006783655460139556
```

Matlab Code



```
true_Value=0.006737947;
N=20;
sum=1;
%approach1
for i=1:N
    if mod(i,2)==0
        sum=sum+((5^i)/factorial(i));
    else
        sum=sum-((5^i)/factorial(i));
    end
end
fprintf("Approach 1 %.20f",sum);
fprintf("\n")


%approach2
for i=1:N
    sum=sum+((5^i)/factorial(i));
end
sum=1/sum;
fprintf("Approach 2 %.20f",sum);
```

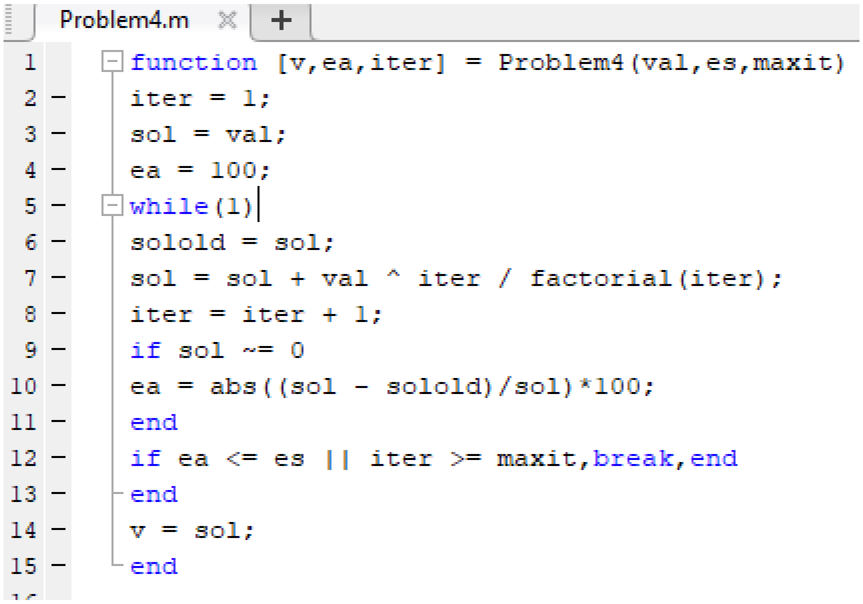
Output



```
>> Problem3
Approach 1 0.00674554009771181733
Approach 2 0.00678334505820460659>>
```

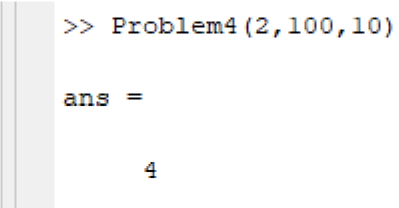
Q4:

Maltab Code



```
function [v,ea,iter] = Problem4(val,es,maxit)
iter = 1;
sol = val;
ea = 100;
while(1)
sololdd = sol;
```

Output



```
>> Problem4(2,100,10)

ans =

     4
```