MATHLAB-IV Masters Final 2017-18

Part-B: Fortran Programming

08. Find real root of the equation $x^3 - 2x - 5 = 0$ using Bisection method

Solution:

```
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        f(x) = x*x*x - 2.0*x -5.0
        print*,"Enter the value of a and b : "
10      read(5,*) a,b
        f1 = f(a)
        r  = f(b)
        if( r*f1 .GE. 0.0) goto 10
        print*,"   N              A              B"
        n = 1
        q = 0.1e-4
20      c = (a+b)/2
        g = f(c)
        if( g .EQ. 0.0) then
          b = c
        else
          a  = c
          f1 = g
        end if

        if(abs(b-a) .LT. q) goto 35
        write(6,30) n,a,b
30      format(3x , i2 , 2x , 2f15.6)
        n = n+1
        goto 20
35      c=(a+b)/2
        write(6,50) c
50      format(3x, "The root is x =" , f15.6)
        end


---------------------------------------------------------------
Sample Input: 2  3
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```

10. Find the value of $\int_a^b e^{\frac{x}{2}} dx$ using Trapezoidal rules

Solution:

```
        integer i
        real h, sum , x , f , a , b
        print*,"Enter the value of a and b"
        read*, a , b
        n = 60
        h = (b-a)/real(n)
        sum = 0.5*(f(a)+f(b))
        do i = 1 , n-1
           x = a+i*h
           sum = sum + f(x)
        enddo
        sum = h*sum
        print*,"Value of the Integration = ", sum
        end

        function f(x)
        f = exp(x/2.0)
        return
        end function
```

Sample Input: 1 2

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12. Integration using simpson 3/8 rules

Solution:

```
---------------------------------------------------------------
        real function f(x)
        real x
        f = 1.0 - exp(-x/2.0)
        return
        end function

        real y(7)
        real a,b,sum,n,init
        print*,"Enter lower and upper limit: "
        read*,a,b
        init = a
        n = 6.0
        h = (b-a)/n

        do i=1,7
           y(i) = f(init)
           init = init + h
        enddo
        sum = h/3.0*((y(1)+y(7)) + 4*(y(2)+y(4)+y(6)) +    2*(y(3)+y(5)))
        print*,"Value of the Integration = ",sum
        end


---------------------------------------------------------------
Sample Input: 1 2
---------------------------------------------------------------
```

15. Determining binomial coefficient nCr using function sub program

Solution:

```
---------------------------------------------------------------
        integer n,r
  22    print*,"Enter the value of n and r"
        read*,n,r
        if(n .LE. r) then
           print*,"n must be greater than r"
           goto 22
        endif
        nr = n-r
        ib = ifact(n)/(ifact(r)*ifact(nr))
        print*,"value of nCr = ",ib
        end

        function ifact(k)
         isum = 1;
         do i = 1,k
            isum = isum * i
         enddo
         ifact = isum
        return
        end
```

Sample Input: 5 2

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16. Matrix Multiplication C=AB Where order of A = 3x4 and B = 4x5

Solution:

```
-----------------------------------------------------------------

        integer p
        parameter(m=3,n=4,p=5)
        dimension a(m,n), b(n,p) , c(m,p)

        print*,"Enter the Matrix A: "
        read*, ((a(i,j), j=1,n), i=1,m)
        print*,"Enter the Matrix B: "
        read*, ((b(i,j), j=1,p), i=1,n)

        do i=1,m
           do j=1,p
             sum = 0.0
             do k=1,n
                sum = sum + a(i,k)*b(k,j)
                c(i,j) = sum
             enddo
           enddo
        enddo

        print*," Product of A and B Matrix"
        print 30, ((c(i,j),j=1,p),i=1,m)
   30   format(2x3(2x,F8.2))
        end
-----------------------------------------------------------------
Sample Input: Matrix A: 1 2 3 2 1 3 5 3 1 4 2 3
              Matrix B: 2 1 3 5 8 6 5 4 2 1 4 5 6 7 3 4 5 6 3 4
-----------------------------------------------------------------
```