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ASSIGNMENT

All In One

BCSL-058

Computer Oriented Numerical Techniques Lab

Prepared by

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STEP 1

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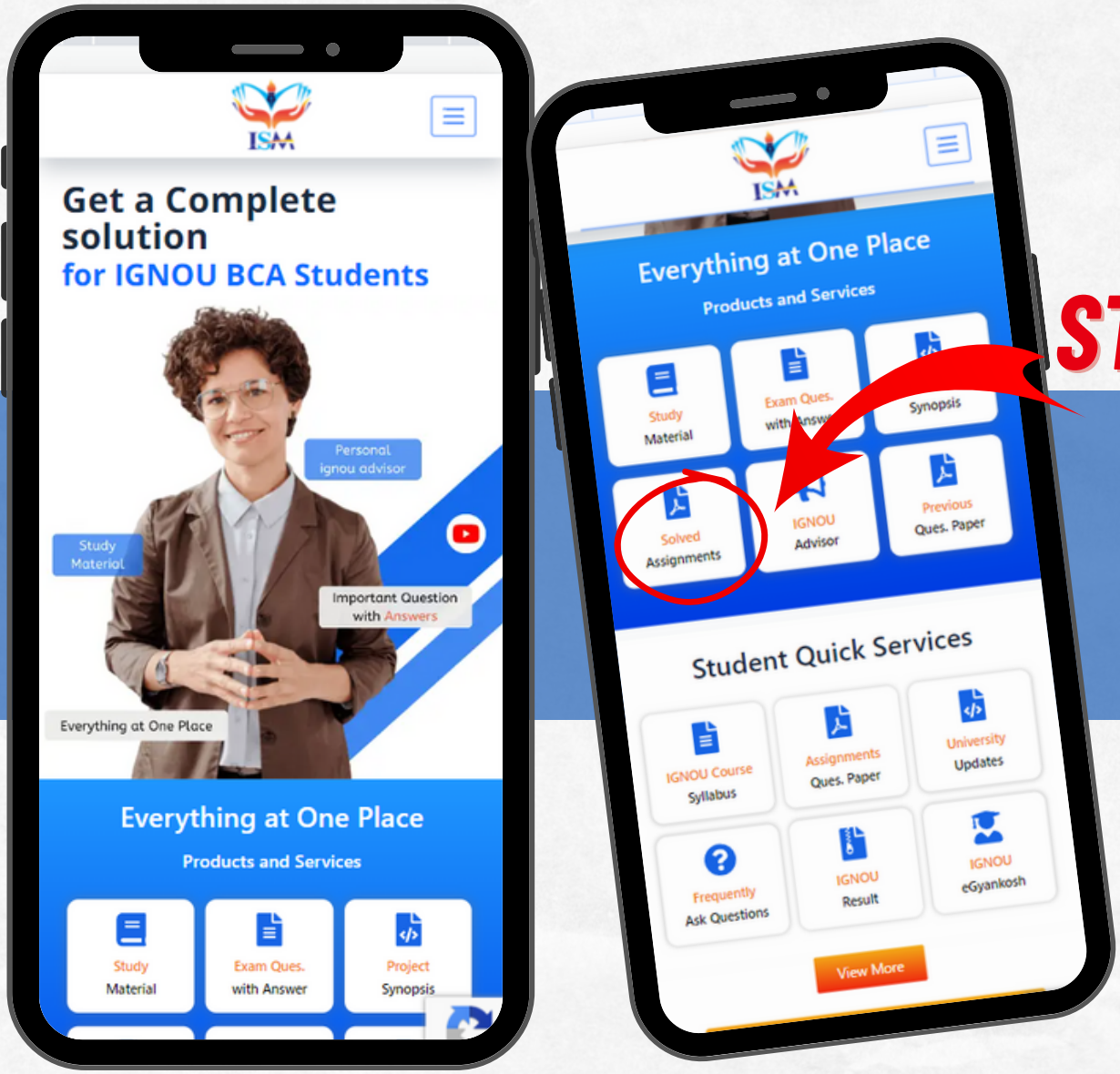

STEP 2

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Ques.6 Write a program in C/C++ to calculate the value of "cos x" by using the series expansion given below: Cos x= 1- x^2/2! + x^4/4! + x^6/6! +.....

Note:

- **Evaluate cos x only up to first three terms.**
- **Also, find the value of cos x by using the inbuilt function.**
- **Compare the results i.e., the result produced by your program and that produced by the inbuilt function. Based on comparison, determine error.**

Sol.

```
#include <stdio.h>

double cos_series(double x, int n) {
double sum = 1;
double factorial = 1;

for (int i = 1; i <= n; i++)
factorial *= i;
sum += (-1) * pow(x, 2 * i) / factorial;
}

return sum;
}
```

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```
int main() {
double x = 3.14159;
int n = 10;

double cos_x = cos_series(x.n);

printf("The value of cos(%f) is: %f \n", x, cos_x);

return 0;
}
```

Ques.7 Write a program in C/C++ to find the value of Sin(π/6) by using Lagrange's Interpolation, the related data is given below

x:	**0**	**π /4**	**π/2**
y = Sin(x):	**0**	**0.70711**	**1.0**

Sol. #include <stdio.h>

```
double lagrange_interpolation(double x, double x_data[], double y_data[], int n){
double p=0;
```

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```
for (int i = 0; i < n; i++) {
double prod = 1;
for (int j = 0; j < n; j++) {
if (i != j) {
prod *= (x- x_data[j]) / (x_data[i]- x_data[j]);
    }
  }
    p += prod * y_data[i];
 }

return p;
}

int main() {
double x = 1.0 / 6.0 * 3.14159;
double x_data[] = {0, 1.0 / 4.0 * 3.14159, 1.0 / 2.0 * 3.14159};
double y_data[] = {0, 0.70711, 1.0};
int n = 3;

double sin_x = lagrange_interpolation(x, x_data, y_data, n);

printf("The value of sin(%f) is: %f\n", x, sin_x);

return 0;
}
```

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Ques.8 Write a program that approximates the value of a definite integral ∫ f(x) using Simpson 1/3 Rule, with M sample points. Find an approximate value of the integral of 2x3/2 using the program with 8 intervals over the interval [1, 9]

Ans.

```
#include <stdio.h>

double simpson_1_3_rule(double a, double b, double f(double x), int M) {

double h = (b- a) / M;
double integral = f(a) + f(b);

for (int i = 1; i < M; i += 2) {
integral += 4 * f(a + i * h);
}

for (int i = 2; i < M- 1; i += 2) {
integral += 2 * f(a + i * h);
}

return h * integral / 3;
}

int main() {
double a = 1;
double b = 9;
```

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```
double f(double x) {
return 2 * pow(x, 3.0 / 2.0);
}

int M = 8;

double integral = simpson_1_3_rule(a, b, f, M);

printf("The approximate value of the integral is: %f\n", integral);

return 0;
}
```

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