

3 Yr. Degree/4 Yr. Honours 3rd Semester Examination, 2024 (CCFUP)

Subject : Chemistry

Course: CHEM3051 (SEC)

Time: 2 Hours

Full Marks: 40

*The figures in the right hand margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*

1. Answer any five questions:

2×5=10

(a) Plot $y = x^2 \cdot e^{-x^2}$ in the range 0 to ∞ .(b) Convert $(100)_2$ $(10101)_2$ to decimal.

1+1

(c) Error in measurement of diameter of a sphere is 1%. Calculate the percentage error in determining the volume.

(d) Write a program to calculate factorial of an integer.

(e) Show that the function $2x^2 - 3x + 1$ is decreasing at $x = 0$ and increasing at $x = 1$.

(f) Give Fortran statement:

$$Z = |X^2 - Y^2| + 6e^{XY}$$

(g) Mention two limitations of solver in excel.

(h) Plot ' $t_{1/2}$ ' vs. 'C' for a first order reaction.

2. Answer any two questions from the following:

5×2=10

(a) Write a FORTRAN program for printing all Fibonacci numbers up to 100.

(b) Compute a root of the equation $x^2 - 5x + 6 = 0$ using Newton-Raphson method.
[Take $X_0 = 5$](c) Use the method of least squares to find a formula of the type $Y = mX + C$ which fits the following data.

X	1.0	2.0	3.0	4.0	5.0	6.0
Y	2.0	3.9	5.9	8.2	10.1	12.0

(d) Write a program for arranging numbers in descending orders. What does '= LINES (array1, array2, False, True)' signify?

3+2

Please Turn Over

3. Answer any two questions from the following:

10×2=20

(a) (i) Calculate the mean, variance and standard deviation of the following data:
1, 3, 5, 7, 9

(ii) Sketch the curve $Y = X^2 - 2X$ with proper Labelling using dataset. 5+5

(b) (i) Derive the expression for the slope and intercept of a straight line assuming there is no error in the determination of 'X'.

(ii) Find the output of following program:

K = 3

DO 22J = 5, 10, 2

K = K + J

IF (K.G T. 8) GO TO 33

22 CONTINUE

33K = 4*K

(iii) If $a^2 + b^2 = 7ab$, show that $\log\left\{\frac{1}{3}(a+b)\right\} = \frac{1}{2}(\log a + \log b)$. 5+3+2

(c) (i) Write a Fortran Program to compute the product of two matrices of order 3×3 .

(ii) $F(x) = x^2 - 2x - 3$ is defined on the set of real numbers. Show that $F(1+a) = F(1-a)$ for any real value of a .

(iii) Convert $(108)_{10}$, $(55)_{10}$ to binary. 5+3+2

(d) (i) Use Trapezoidal Rule to calculate the value of $\int_1^5 (x^2+1) dx$ taking $h = 1$.

(ii) Write a Fortran Program to compute the roots of quadratic equation $ax^2 + bx + c = 0$.

(iii) Evaluate the Integral $\int_0^e \left\{ \frac{1}{\log x} - \frac{1}{(\log x)^2} \right\} dx$. 4+4+2