

M.SC.(Phy.) Semester - 4 (CBCS) Examination

April/May-2023 (NEW COURSE)

Numerical Analysis and Computer Programming (Core)

Time: 2:30 Hours

Marks: 70

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

Q.1 Answer any seven of the following:

14

- (a) What do you mean by least square fitting of experimental data? How it is useful.
- (b) Briefly explain how interpolation and extrapolation of experimental data are useful.
- (c) List the methods used to solve linear equations.
- (d) What are the different methods used to solve ordinary differential equations and numerical integrations?
- (e) Define a Fourier series and write its mathematical presentation.
- (f) Name the languages used to write scientific programs.
- (g) Define 'Computer'. What is the importance of 'Operating system'?
- (h) Briefly discuss significance of flow – chart.
- (i) List out the comparative control statements and their FORTRAN Code.
- (j) What are the different types of "IF" statements?

Q.2 Answer any two of the following:

14

- (a) Use the method of least square; fit a straight line to the data given below:

x	1	3	5	7	9
y	1.5	2.8	4.0	4.7	6.0

- (b) Solve the following set of linear equations using Cramer's rule:

$$2x + 3y + 2z = 14$$

$$5x + y + z = 10$$

$$x + 5y + 3z = 20$$
- (c) Show how Fourier series is used for expansion of Reimann – Zeta function?

Q.3 Answer the following:

14

- (a) Give the equation: $\frac{dy}{dx} = 2x^3 - 1$ with $y(1) = 2$, estimate y
 - (2) by Euler's method using
 - (i) $h=1.0$ and
 - (ii) $h=0.5$. Compare the result with exact solution.
- (b) A curve is drawn to pass through the following points:

x	1	2	3	4	5
y	1.5	3.5	4.5	6.5	8.5

Estimate the area bound by the curve, x-axis and line $x = 1$ and $x = 5$. Also find the volume of solid generated by revolving this area using Weddle's rule.

OR

Q.3 Answer the following:

14

- (a) Discuss in brief with two examples of each shape used in flow chart.
- (b) Explain the hierarchy of operation followed by FORTRAN. Define integer and real variables, list and explain the built in functions.

Q.4 Answer any two of the following:**14**

- (a) Briefly discuss the FORMAT function. List and explain the use of various FORMAT specifiers with appropriate examples.
- (b) Using logical IF statement, write a FORTRAN program to calculate the mean weight of female and male candidates.
- (c) Write the common statement for the 'DO'. Discuss 'Implied' do loop and its implementation. Discuss the rule to be followed using 'DO' loop.

Q.5 Answer any two of the following:**14**

- (a) List the control statements. Using the flow chart explain the various logical IF statements.
- (b) Describe in detail, the method of generating algorithm.
- (c) Discuss application of Fourier series for square wave analysis; show that square wave contains large number of high frequency components.
- (d) Use Lagrange's formula to find the exact form of $f(x)$ and find the value of $f(3)$.

x	0	2	3	6
$f(x)$	648	704	729	792
