DAF-003-0494001 Seat No. _____

B. Sc. / M. Sc. (Applied Physics) (Sem. IV) Examination

April - 2022

Paper-XIII : Modern Computational Techniques & Programming

(New Course)

Faculty Code : 003

Subject Code : 0494001

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) Attempt all FIVE questions.
(2) Numbers in the right margin indicate marks.

1 Answer the following : (Any 7 out of 10) **2×7=14**

(1) Differentiate between Assembly language (Low level language) and High Level language.

(2) What is hardware? Explain with example.

(3) Find the Decimal equivalent to $(1011001.111)_2$

(4) Explain floating point representation in the computer for a field width of 32 bits.

(5) What is a transcendental equation? What are its characteristics?

(6) Explain Bracketing methods and Open end methods.

(7) The polynomial P(X) = = $X^3 - 6X^2 + 11\ X - 6 = 0$ has a root at X = 2. Find the quotient polynomial q(X) such that P(X) = (x – 2) q(X).

(8) Convert binary number 110100101100.11001 in to Octal number System.

(9) Using suitable method, find the roots of the equation up to 3 decimal places. $X^2 - 2X - 63 = 0$

(10) Distinguish between System software and Application software.

2 (A) Answer the following : (Any 2 out of 3) **5×2=10**

(1) Explain Different Types of Digital computer in detail.

(2) Write the following numbers in normalized exponential form and E form :

(a) 1245.345

(b) –0.0087527

(c) 0.0008744

(d) –8754.345

(e) 0.000

(3) Enlist the properties of n^{th} degree polynomial regarding its roots.

(B) Answer the following : (ANY **ONE**) **4×1=4**

(1) Give the difference between iterative methods and direct solution methods.

(2) Convert the binary number 110110111.1010 into 1. Octal number

(3) Hexadecimal number

3 Answer the following : (Any 2 out of 3) **7×2=14**

(1) State Descartes' rule to estimate the number of real roots of a polynomial. Find number of real roots for polynomial $F(X) = X^5 + 4X^4 - 3X^2 + X - 6 = 0$

(2) Explain and derive the Newton Raphson iterative formula for evaluating a root of a nonlinear equation.

(3) Assuming that the mantissas are truncated to 4 decimal digits. Find the result of the following operations :

(1) $0.5678 \times 10^4 + 0.6666 \times 10^4$

(2) $0.3366 \times 10^{-2} - 0.2244 \times 10^{-1}$

(3) $0.6789 \times 10^6 \times 0.4367 \times 10^8$

(4) 0.9654×10^{15} / (divided by) 0.4378×10^6

4 Answer the following : (Any 2 out of 3) **7×2=14**

(1) Write an algorithm to convert any non-decimal number into decimal number system. (integral part and fractional part)

(2) What is a computer? Draw and explain basic block diagram of a computer.

(3) Find the root of the following equation using Bisection Method

$F(X) = X^2 - 4X - 10 = 0$ $[-2 < X < -1]$ up to 5 iterations.

5 Answer the following : (Any 2 out of 4) **7×2=14**

(1) What is synthetic division? How is it used to obtain the multiple roots of a polynomial?

Explain with $P(X) = (X - 3)\ q(X)$
where $P(X) = X^3 + 4X^2 - 9X - 36 = 0$

(2) Discuss the errors with example that are occur during the floating point arithmetic operation.

(3) Explain and derive the false position formula for evaluating a root of a nonlinear equation.

(4) Determine the root of the system of nonlinear equations

$X^2 + XY = 6$

$X^2 - Y^2 = 3$

using Newton Raphson method up to 3 iterations.