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Reg. No. :

Code No. : 6784

Sub. Code : KPHE 21

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2017.

Second Semester

Physics

Elective — NUMERICAL METHODS AND
PROGRAMMING IN C++

(For those who joined in July 2016 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. If $f(x) = \frac{1}{x^2}$, the value of divided difference $f(a, b)$ is

- (a) $\frac{a+b}{a^2 b^2}$ (b) $-\frac{a+b}{a^2 b^2}$
(c) $\frac{a-b}{a^2 b^2}$ (d) $\frac{b-a}{a^2 b^2}$

2. If $f(x)$ be a polynomial of n^{th} degree in x , then n^{th} difference of $f(x)$ is

- (a) zero (b) finite constant
(c) one (d) $\frac{df^n(x)}{dx^n}$

3. If δ^n is a central difference operator, then

- (a) $\delta = E - E^{-1}$ (b) $\delta = E^{1/2} - E^{-1/2}$
(c) $\delta = E^{1/3} - E^{-1/3}$ (d) $\delta = E^2 - (E^{-1})^2$

4. n^{th} divided difference of a polynomial of degree n is

- (a) zero (b) constant
(c) one (d) variable parameter.

5. The value of $\nabla - \Delta$ is

- (a) 0 (b) 1
(c) $\nabla \cdot \Delta$ (d) non defined.

6. The cube root of 12 by Newton-Raphson method is

- (a) 2.302 (b) 2.289
(c) 2.278 (d) 2.928.



7. The value of $E^2 f(x)$ with interval n is

(a) $[f(x+h)]^2$ (b) $f(x+2h)$

(c) $|f(x-h)|^2$ (d) $f(x-2h)$.

8. Which classes allow primitive types to be accessed as objects?

(a) storage (b) virtual

(c) friend (d) wrapper.

9. The statement $i++$ is equivalent to

(a) $i = i + 1$ (b) $i = i + i$

(c) $i = i - 1$ (d) $i --$

10. Minimum number is temporary variable needed to swap the contents of 2 variables

(a) 3 (b) 2

(c) 1 (d) 0.

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Using Gauss-Jordan method, find the inverse

of the matrix $A = \begin{bmatrix} 2 & 2 & 3 \\ 2 & 11 & 1 \\ 1 & 3 & 5 \end{bmatrix}$.

Or

(b) Solve by Gauss-Seidal method

$x - 2y = -3$
 $2x + 25y = 15$ correct to 4 decimal places.

12. (a) Find the values of y at $x=21$ and $x=28$ from the following data, using Newton difference formula

$x:$	20	23	26	29
$y:$	0.3420	0.3907	0.4384	0.4848

Or

(b) Using Lagranges interpolation formula find $f(4)$ given that, $f(0)=2, f(1)=3, f(2)=12, f(15)=3587$.



13. (a) Compute the value of $\int_1^2 \frac{dx}{x}$ using Simpsons $\frac{1}{3}$ rule, take $h=0.25$.

Or

- (b) Using modified Eulers method find $y(0.2)$ and $y(0.4)$ from $\frac{dy}{dx} = x + y$, $y(0) = 1$ with $h = 0.2$.

14. (a) Explain classes and objects with an example.

Or

- (b) Define switch statement with syntax and flow chart.

15. (a) Give the structure of C++ program.

Or

- (b) Write a program for Newton-Raphson method for finding the root of the quadratic equation.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Using Newton-Raphson method solve,
 $x^3 - x - 1 = 0$.

Or

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- (b) Solve the following equation by Gauss-Seidal method.

$$27x + 6y - z = 85$$

$$x + y + 54z = 110$$

$$6x + 15y + 2z = 72.$$

17. (a) Using Lagranges formula find $f(x)$ and also $f(2)$ from given data.

$$x: \quad 0 \quad 1 \quad 3 \quad 4$$

$$y: -12 \quad 0 \quad 6 \quad 2$$

Or

- (b) Using Newton's backward formula, find the polynomial of degree (3) passing through (3,0), (4,24), (5,60) and (6,120).

18. (a) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by

(i) Trapezoidal rule.

(ii) Simpson's $\frac{1}{3}$ rule.

Or

- (b) Using Taylors method solve $\frac{dy}{dx} = 1 + xy$ with $y_0 = 2$ find $y(0.1)$, $y(0.2)$ and $y(0.3)$.

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19. (a) Explain operators in C++.

Or

(b) Write a program to check whether an integer is positive or negative or zero using if else statement in C++.

20. (a) Write a program for solving differential equation via Runge-Kutta fourth order method.

Or

(b) Write a program to find the root of an polynomial equation using Secant method.

