18001835

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Reg. No.....

Name.....

M.Sc. DEGREE (C.S.S.) EXAMINATION, NOVEMBER 2018

Third Semester

Faculty of Science

Branch II : Physics–A–Pure Physics

PH3 C10—COMPUTATIONAL PHYSICS

(2012 Admission onwards)

Time : Three Hours Maximum Weight : 30

Part A

Answer any **six** *questions.*
Each question carries 1 *weight.*

1. Explain the principle of least square fitting.
2. Write down Newton's forward difference interpolation formulae.
3. Explain T-test.
4. State and explain Simpson's ½ rule.
5. What is meant by Romberg integration ?
6. Give the modified Euler's method for differential equation.
7. Explain the basic principle of predictor -corrector method.
8. Explain Gauss - Jordan method for inverse of a matrix.
9. Briefly explain stability concept.
10. State the features of Schmidt method.

(6 × 1 = 6)

Part B

Answer any **four** *questions.*
Each question carries 2 *weight.*

11. Certain experimental values of x and y are given below :

x	:	0	2	5	7
y	:	–1	5	12	20

If $y = a_0 + a_1 x$, find approximate values of a_0 and a_1.

Turn over

12. Find the Lagrange's interpolating polynomial of degree 2 approximating the function $y = \ln x$ defined by the table values. Hence determine the value of ln 2.7 :

x	:	2	2.5	3.0
$y = \text{In } x$	:	0.69315	0.91629	1.09861

13. Find (dy/dx) and (d^2y/dx^2) at $x = 1.6$ for the function given below :

x	:	1	1.2	1.4	1.6	1.8	2	2.2
y	:	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

14. Using the Cubic Spline method evaluate $\text{I} = \int_0^1 \sin \pi x \, dx$.

15. Solve the following system using Gauss method :

$2x + y + z = 10$;

$3x + 2y + 3z = 18$;

$x + 4y + 9z = 16$.

16. Solve the following system using Gauss - Seidel method.

$10x + 2y + z = 9$

$2x + 20y - 2z = -44$

$-2x + 3y + 10z = 22$.

$(4 \times 2 = 8)$

Part C

Answer **all** *questions.*
Each question carries 4 *weight.*

17. (a) Discuss Gaussian integration formula with different spacing :

Find $\text{I} = \int_0^1 x \, dx$ using Gauss formula.

Or

(b) Discuss on Romberg integration methods. Use Romberg integration method to compute $\text{I} = \int_0^1 \frac{1}{1+x} \, dx$ correct to three decimal places.

18. (a) Discuss the method of least squares for continuous functions. Construct a least squares quadratic approximation to the function $y\ (x) = \sin x$ on $[0, \pi/2]$ with respect to the weight function $w\ (x) = 1$.

Or

(b) Obtain Lagrange's interpolation formula. The population of a town in decennial census was as under. Estimate the population for the year 1955.

Year	:	1921	1931	1941	1951	1961
Population in thousands	:	46	66	81	93	101

19. (a) "The R- K methods are designed to give greater accuracy and they possess the advantage of requiring only the function values at some selected points on the subinterval." Establish.

Or

(b) Find the solution to three decimals, of the system

$83x + 11y - 4z = 95$;

$7x + 52y + 13z = 104$;

$3x + 8y + 29z = 71$

Using Jacobi and Gauss - Seidel methods.

20. (a) Obtain the ideas and concepts in finite difference method. Write down the finite - difference analogue of the parabolic equation $(du/dt) = (d^2u/dx^2)$; given that $u = 1$ when $t = 0$ and $u = 0$ at $x = 0$ and $x = 1$. Compute the solution of the above equation at $x = 0.1$ and $t = 0.01$ using Jacobi method.

Or

(b) Discuss on weighted average implicit method and consequences. Solve the solutions of a problem of your own interest using this method.

$(4 \times 4 = 16)$