16U603 (Pages: 3) Name: …………..……..…….

Reg. No……………..………

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2019

(Regular/Supplementary/Improvement)

(CUCBCSS-UG)

CC15U MAT6 B11 - NUMERICAL METHODS

Mathematics - Core Course

(2015 Admission onwards)

Time: Three Hours Maximum: 120 Marks

Part-A

Answer ***all*** questions. Each question carries 1 mark.

1. Give an example of transcendental equation.
2. Write Newton - Raphson formula for the approximate root of transcendental equation.
3. Find $\Delta^2 x$
4. Define the mean operator μ
5. Define the central difference operator δ
6. Define interpolation.
7. Write the relation between the forward difference operator Δ and differential operator D.
8. By Simpson's $\frac{1}{3}$-rule $\int_{x_0}^{x_n} y\, dx = \cdots$
9. Write the Trapezoidal rule for numerical integration.
10. Define the characteristic equation of a square matrix A
11. Define spectrum of a square matrix.
12. Write the second order Runge-Kutta formula.

(12 × 1 = 12 Marks)

Part-B

Answer any ***ten*** questions. Each question carries 4 marks.

13. Explain Bisection Method.
14. Find a real root of $x^3 - x - 4 = 0$ by the method of false position.
15. Prove that $\nabla E = \delta E^{\frac{1}{2}}$
16. Given $u_x = e^{ax+b}$, then find $\Delta^n u_x$
17. Prove that $\mu^2 = 1 + \left(\frac{1}{4}\right)\delta^2$
18. Draw the table for Gauss Central difference backward formula.
19. Prove that the divided difference of a constant is zero.
20. Prove that the divided differences are symmetric functions of their arguments.
21. Use Simpsons $\frac{3}{8}$ Rule, find $\int_{1.6}^{2.2} y dx$ from the table

x	1.6	1.8	2	2.2
y	4.953	6.05	7.389	9.025

 Turn Over

22. Find the Eigen values of the matrix $\begin{bmatrix} 2 & 4 \\ 0 & 1 \end{bmatrix}$

23. Decompose the matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ in to the form LU, where L is the lower triangular matrix and U is an upper triangular matrix.

24. Find $y(0.01)$ by Euler's method, given that $y' = xy$ and $y(0) = 1$

25. Find the first approximation for y from the differential equation $y' = x + y$ with $y(0) = 1$, using Picard's method.

26. Give the predictor-corrector formula by Adams-Moulton method.

(10 × 4 = 40 Marks)

Part-C

Answer any ***six*** questions. Each question carries 7 marks.

27. Find the smallest root of the equation $x^3 - 6x^2 + 11x - 6 = 0$, using Ramanujan's Method.

28. Solve by Secant method to find a real root of $x^3 - 2x - 5 = 0$

29. Find the value of $y(0.05)$ from the following table using Newton's forward difference interpolation formula

x	0	0.1	0.2	0.3	0.4
y	1	1.2214	1.4918	1.8221	2.2255

30. Use Lagrange formula to find a cubic polynomial which approximate the following data

x	-2	-1	2	3
y	-12	-8	3	5

31. Find x for $sinhx = 62$ from the table

x	4.80	4.81	4.82	4.83	4.84
$y = sinhx$	60.7511	61.3617	61.9785	62.6015	63.2317

32. Find $\frac{dy}{dx}$ at $x = 1$ and at $x = 3$ from the computed table

x	0	1	2	3	4	5	6
y	6.9897	7.4036	7.7815	8.1291	8.451	8.7506	9.0309

33. Solve using Gauss elimination method

$$x + y + z = 9$$
$$2x - 3y + 4z = 13$$
$$3x + 4y + 5z = 40$$

34. Find the inverse of the matrix $\begin{bmatrix} 4 & -1 & 2 \\ -1 & 2 & 3 \\ 5 & -7 & 9 \end{bmatrix}$ by LU decomposition method.

35. Using 4th order Runge-Kutta method evaluate $y(0.2)$ and $y(0.4)$ where $\frac{dy}{dx} = 1 + y^2$ and $y(0) = 0$

(6 × 7 = 42 Marks)

Part- D

Answer any ***two*** questions. Each question carries 13 marks.

36. (a) Find a double root of $f(x) = x^3 - 7x^2 + 16x - 12$ by using generalized Newton's method with $x = 1.5$

(b) Solve the equation $x^3 - 9x + 1$ for the root lying between 2 and 3, correct to 3-significant figures.

37. From the following table find the number of students who obtained marks between 60 and 70 using Gauss backward interpolation formula

Marks	No of Students
0-40	250
40-60	120
60-80	100
80-100	70
100-120	50

38. (a) Explain Predictor-Corrector Milne's method.

(b) Find $y(0.3)$ for the differential equation $\frac{dy}{dx} = x^2 + y^2 - 2$ satisfying $y(-0.1) = 1.09$ $y(0) = 1$, $y(0.1) = 0.89$, $y(0.2) = 0.7605$

(2 × 13 = 26 Marks)

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